Annual Water Data Report

Documentation

Downstream order and station number

Since October 1, 1950, hydrologic-station records in USGS reports have been listed in order of downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary entering between two mainstream stations is listed between those stations. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is located with respect to the stream to which it is immediately tributary is indicated by an indention in that list of stations in the front of this report. Each indentation represents one rank. This downstream order and system of indentation indicates which stations are on tributaries between any two stations and the rank of the tributary on which each station is located.

As an added means of identification, each hydrologic station and partial-record station has been assigned a station number. These station numbers are in the same downstream order used in this report. In assigning a station number, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list composed of both types of stations. Gaps are consecutive. The complete 8-digit (or 10-digit) number for each station such as 09004100, which appears just to the left of the station name, includes a 2-digit part number "09" plus the 6-digit (or 8-digit) downstream order number "004100." In areas of high station density, an additional two digits may be added to the station identification number to yield a 10-digit number. The stations are numbered in downstream order as described above between stations of consecutive 8- digit numbers.

Numbering system for wells and miscellaneous sites

The USGS well and miscellaneous site-numbering system is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, and the next 7 digits denote degrees, minutes, and seconds of longitude; the last 2 digits are a sequential number for wells within a 1-second grid. In the event that the latitude-longitude coordinates for a well and miscellaneous site are the same, a sequential number such as "01," "02," and so forth, would be assigned as one would for wells (see fig. 1). The 8-digit, downstream order station numbers are not assigned to wells and miscellaneous sites where only random water-quality samples or discharge measurements are taken.

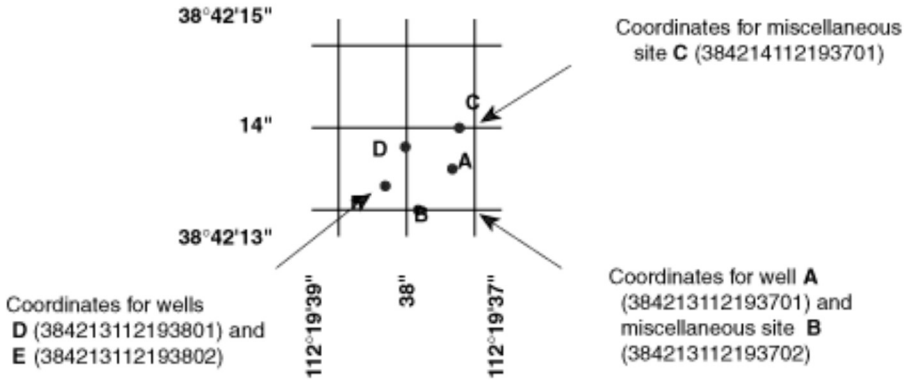


Figure 1. Example of system for numbering wells and miscellaneous sites (latitude and longitude).

In addition to the well number that is based on the latitude and longitude for each well, another well number may be provided which in many States is based on the Public Land Survey System, a set of rectangular surveys that is used to identify land parcels. This well number is familiar to the water users in, for example, Utah and shows the location of the well by quadrant, township, range section, and position within the section (see fig. 2).

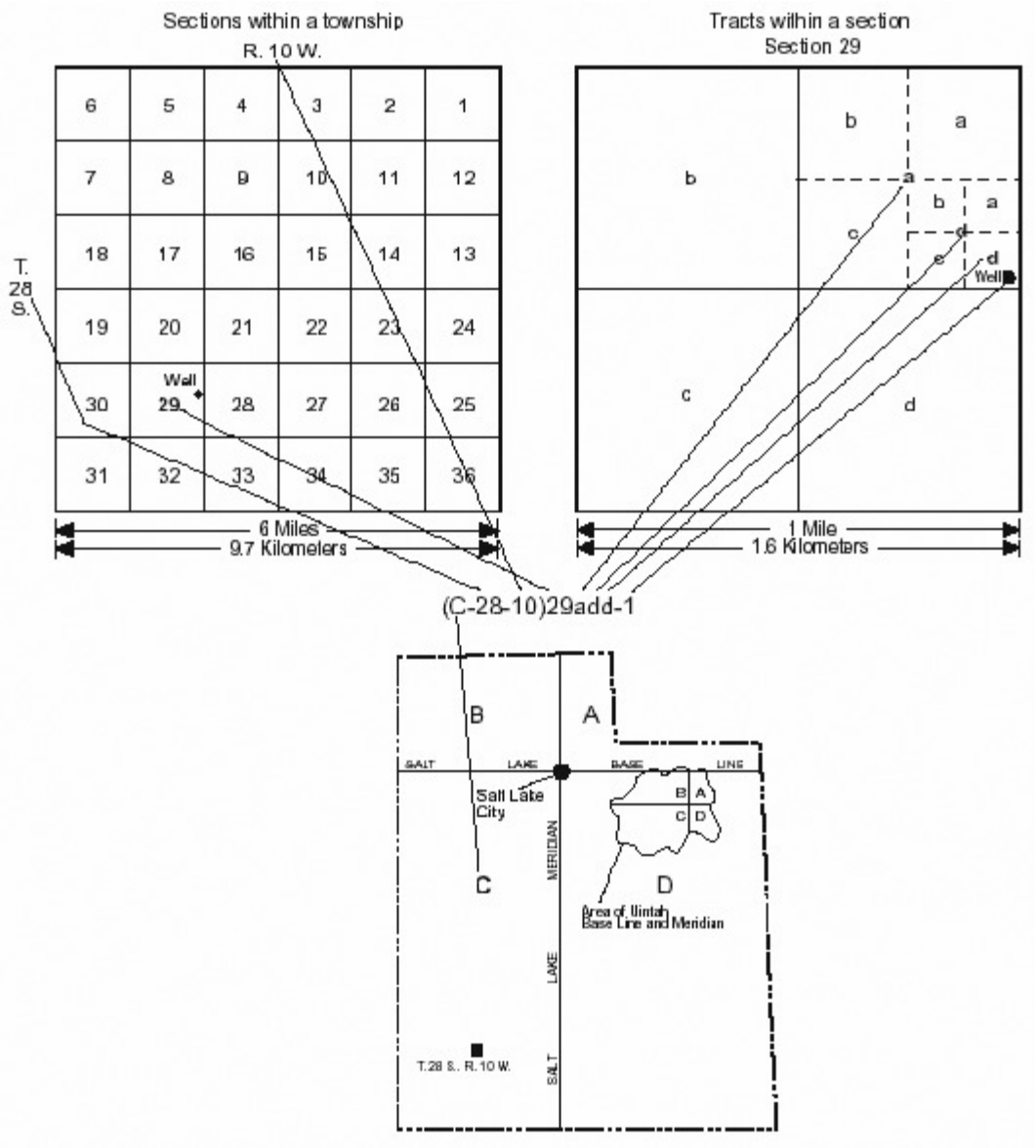


Figure 2. Example of system for numbering wells and miscellaneous sites (township and range).

Some Water Science Centers also identify each ground-water site by a local number that consists of an abbreviation of the county name as well as the township, range and section, and a four-digit number assigned to the well. Naming conventions specific to an individual Water Science Center can be obtained locally from each USGS Water Science Center.

Explanation of stage- and water-discharge records

Data Collection and Computation

The base data collected at gaging stations consist of records of stage and measurements of discharge of streams or canals, and stage, surface area, and volume of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. Records of stage are obtained from a water-stage recorder that is either downloaded electronically in the field to a laptop computer or similar device or is transmitted using telemetry such as GOES satellite, land-line or cellular-phone modems, or by radio transmission. Measurements of discharge are made with a current meter or acoustic Doppler current profiler, using the general methods adopted by the USGS. These methods are described in standard textbooks, USGS Water- Supply Paper 2175, and the Techniques of Water-Resources Investigations of the United States Geological Survey (TWRIs), Book 3, Chapters A1

through A19 and Book 8, Chapters A2 and B2, which may be accessed from http://water.usgs.gov/pubs/twri/. The methods are consistent with the American Society for Testing and Materials (ASTM) standards and generally follow the standards of the International Organization for Standardization (ISO).

For stream-gaging stations, discharge-rating tables for any stage are prepared from stage-discharge curves. If extensions to the rating curves are necessary to express discharge greater than measured, the extensions are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, or computation of flow over dams and weirs), step-backwater techniques, velocity-area studies, and logarithmic plotting. The daily mean discharge is computed from gage heights and rating tables, then the monthly and yearly mean discharges are computed from the daily values. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features of the stream channel, the daily mean discharge is computed by the shifting-control method in which correction factors that are based on individual discharge measurements and notes by engineers and observers are used when applying the gage heights to the rating tables. If the stage-discharge relation for a station is temporarily changed by the presence of aquatic growth or debris on the controlling section, the daily mean discharge is computed by the shifting-control method.

The stage-discharge relation at some stream-gaging stations is affected by backwater from reservoirs, tributary streams, or other sources. Such an occurrence necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means of an auxiliary gage at some distance from the base gage. An index velocity is measured using ultrasonic or acoustic instruments at some stream-gaging stations, and this index velocity is used to calculate an average velocity for the flow in the stream. This average velocity along with a stage-area relation is then used to calculate average discharge. At some stations, the stage-discharge relation is affected by changing stage. At these stations, the rate of change in stage is used as a factor in computing discharge.

At some stream-gaging stations in the northern United States, the stage-discharge relation is affected by ice in the winter; therefore, computation of the discharge in the usual manner is impossible. Discharge for periods of ice effect is computed on the basis of gage-height record and occasional winter-discharge measurements. Consideration is given to the available information on temperature and precipitation, notes by gage observers and hydrologists, and comparable records of discharge from other stations in the same or nearby basins.

For a lake or reservoir station, capacity tables giving the volume or contents for any stage are prepared from stage-area relation curves defined by surveys. The application of the stage to the capacity table gives the contents, from which the daily, monthly, or yearly changes are computed.

If the stage-capacity curve is subject to changes because of deposition of sediment in the reservoir, periodic resurveys of the reservoir are necessary to define new stage-capacity curves. During the period between reservoir surveys, the computed contents may be increasingly in error due to the gradual accumulation of sediment.

For some stream-gaging stations, periods of time occur when no gage-height record is obtained or the recorded gage height is faulty and cannot be used to compute daily discharge or contents. Such a situation can happen when the recorder stops or otherwise fails to operate properly, the intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods, the daily discharges are estimated on the basis of recorded range in stage, prior and subsequent records, discharge measurements, weather records, and comparison with records from other stations in the same or nearby basins. Likewise, lake or reservoir volumes may be estimated on the basis of operator's log, prior and subsequent records, inflow-outflow studies, and other information.

Data Presentation

The records published for each continuous record surface-water discharge station (stream-gaging station) consist of five parts: (1) the station manuscript or description; (2) the data table of daily mean values of discharge for the current water year with summary data; (3) a tabular statistical summary of monthly mean flow data for a designated period, by water year; (4) a summary statistics table that includes

statistical data of annual, daily, and instantaneous flows as well as data pertaining to annual runoff, 7-day low-flow minimums, and flow duration; and (5) a hydrograph of discharge.

Station Manuscript

The manuscript provides, under various headings, descriptive information, such as station location; period of record; historical extremes outside the period of record; record accuracy; and other remarks pertinent to station operation and regulation. The following information, as appropriate, is provided with each continuous record of discharge or lake content. Comments follow that clarify information presented under the various headings of the station description.

LOCATION.-Location information is obtained from the most accurate maps available. The location of the gaging station with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in "River Mileage Measurement," Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

DRAINAGE AREA.-Drainage areas are measured using the most accurate maps available. Because the type of maps available varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps become available.

PERIOD OF RECORD.-This term indicates the time period for which records have been published for the station or for an equivalent station. An equivalent station is one that was in operation at a time that the present station was not and whose location was such that its flow reasonably can be considered equivalent to flow at the present station.

REVISED RECORDS.-If a critical error in a published site data sheet is discovered, a revision is included (where?) in the next publishing cycle following discovery of the error.

GAGE.-The type of gage in current use, the datum of the current gage referred to a standard datum, and a condensed history of the types, locations, and datums of previous gages are given under this heading.

REMARKS.-All periods of estimated daily discharge either will be identified by date in this paragraph of the station description for water discharge stations or flagged in the daily discharge table. (See section titled Identifying Estimated Daily Discharge.) Information is presented relative to the accuracy of the records, to special methods of computation, and to conditions that affect natural flow at the station. In addition, information may be presented pertaining to average discharge data for the period of record; to extremes data for the period of record and the current year; and, possibly, to other pertinent items. For reservoir stations, information is given on the dam forming the reservoir, the capacity, the outlet works and spillway, and the purpose and use of the reservoir.

COOPERATION.-Records provided by a cooperating organization or obtained for the USGS by a cooperating organization are identified here.

EXTREMES OUTSIDE PERIOD OF RECORD.-Information here documents major floods or unusually low flows that occurred outside the stated period of record. The information may or may not have been obtained by the USGS.

REVISIONS.-Records are revised if errors in published records are discovered. Appropriate updates are made in the USGS distributed data system, NWIS, and subsequently to its Web-based national data system, NWISWeb (http://water.usgs.gov/nwis/nwis). Users are encouraged to obtain all required data from NWIS or NWISWeb to ensure that they have the most recent data updates. Updates to NWISWeb are made on an annual basis.

Although rare, occasionally the records of a discontinued gaging station may need revision. Because no current or, possibly, future station manuscript would be published for these stations to document the revision in a REVISED RECORDS entry, users of data for these stations who obtained the record from previously published data reports may wish to contact the USGS Water Science Center in the state where the station is located to determine if the published records were revised after the station was discontinued.

If, however, the data for a discontinued station were obtained by computer retrieval, the data would be current. Any published revision of data is always accompanied by revision of the corresponding data in computer storage.

Manuscript information for lake or reservoir stations differs from that for stream stations in the nature of the REMARKS and in the inclusion of a stage-capacity table when daily volumes are given.

Peak Discharge Greater than Base Discharge

Tables of peak discharge above base discharge are included for some stations where secondary instantaneous peak discharge data are used in flood-frequency studies of highway and bridge design, flood-control structures, and other flood related projects. The base discharge value is selected so an average of three peaks a year will be reported. This base discharge value has a recurrence interval of approximately 1.1 years or a 91-percent chance of exceedence in any 1 year.

Data Table of Daily Mean Values

The daily table of discharge records for streamgaging stations gives mean discharge for each day of the water year. In the monthly summary for the table, the line headed TOTAL gives the sum of the daily figures for each month; the line headed MEAN gives the arithmetic average flow in cubic feet per second for the month; and the lines headed MAX and MIN give the maximum and minimum daily mean discharges, respectively, for each month. Discharge for the month is expressed in cubic feet per second per square mile (line headed CFSM); or in inches (line headed IN); or in acrefeet (line headed AC-FT). Values for cubic feet per second per square mile and runoff in inches or in acre-feet may be omitted if extensive regulation or diversion is in effect or if the drainage area includes large noncontributing areas. At some stations, monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversion data or reservoir volumes are given. These values are identified by a symbol and a corresponding footnote.

Statistics of Monthly Mean Data

A tabular summary of the mean (line headed MEAN), maximum (MAX), and minimum (MIN) of monthly mean flows for each month for a designated period is provided below the mean values table. The water years of the first occurrence of the maximum and minimum monthly flows are provided immediately below those values. The designated period will be expressed as FOR WATER YEARS __-__, BY WATER YEAR (WY), and will list the first and last water years of the range of years selected from the PERIOD OF RECORD paragraph in the station manuscript. The designated period will consist of all of the station record within the specified water years, including complete months of record for partial water years, and may coincide with the period of record for the station. The water years for which the statistics are computed are consecutive, unless a break in the station record is indicated in the manuscript.

Summary Statistics

A table titled SUMMARY STATISTICS follows the statistics of monthly mean data tabulation. This table consists of four columns with the first column containing the line headings of the statistics being reported. The table provides a statistical summary of yearly, daily, and instantaneous flows, not only for the current water year but also for the previous calendar year and for a designated period, as appropriate. The designated period selected, WATER YEARS __-__, will consist of all of the station records within the specified water years, including complete months of record for partial water years, and may coincide with the period of record for the station. The water years for which the statistics are computed are consecutive, unless a break in the station record is indicated in the manuscript. All of the calculations for the statistical characteristics designated ANNUAL (see line headings below), except for the ANNUAL 7-DAY MINIMUM statistic, are calculated for the designated period using complete water years. The other statistical characteristics may be calculated using partial water years. The date or water year, as appropriate, of the first occurrence of each statistic reporting extreme values of discharge is provided adjacent to the statistic. Repeated occurrences may be noted in the REMARKS paragraph of the manuscript or in footnotes. Because the designated period may not be the same as the station period of record published in the

manuscript, occasionally the dates of occurrence listed for the daily and instantaneous extremes in the designated-period column may not be within the selected water years listed in the heading. When the dates of occurrence do not fall within the selected water years listed in the heading, it will be noted in the REMARKS paragraph or in footnotes. Selected streamflow duration-curve statistics and runoff data also are given. Runoff data may be omitted if extensive regulation or diversion of flow is in effect in the drainage basin.

The following summary statistics data are provided with each continuous record of discharge. Comments that follow clarify information presented under the various line headings of the SUMMARY STATISTICS table.

ANNUAL TOTAL.-The sum of the daily mean values of discharge for the year.

ANNUAL MEAN.-The arithmetic mean for the individual daily mean discharges for the year noted or for the designated period.

HIGHEST ANNUAL MEAN.-The maximum annual mean discharge occurring for the designated period.

LOWEST ANNUAL MEAN.-The minimum annual mean discharge occurring for the designated period.

HIGHEST DAILY MEAN.-The maximum daily mean discharge for the year or for the designated period.

LOWEST DAILY MEAN.-The minimum daily mean discharge for the year or for the designated period.

ANNUAL 7-DAY MINIMUM.-The lowest mean discharge for 7 consecutive days for a calendar year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The date shown in the summary statistics table is the initial date of the 7-day period. This value should not be confused with the 7-day 10-year low-flow statistic.

MAXIMUM PEAK FLOW.-The maximum instantaneous peak discharge occurring for the water year or designated period. Occasionally the maximum flow for a year may occur at midnight at the beginning or end of the year, on a recession from or rise toward a higher peak in the adjoining year. In this case, the maximum peak flow is given in the table and the maximum flow may be reported in a footnote or in the REMARKS paragraph in the manuscript.

MAXIMUM PEAK STAGE.-The maximum instantaneous peak stage occurring for the water year or designated period. Occasionally the maximum stage for a year may occur at midnight at the beginning or end of the year, on a recession from or rise toward a higher peak in the adjoining year. In this case, the maximum peak stage is given in the table and the maximum stage may be reported in the REMARKS paragraph in the manuscript or in a footnote. If the dates of occurrence of the maximum peak stage and maximum peak flow are different, the REMARKS paragraph in the manuscript or a footnote may be used to provide further information.

INSTANTANEOUS LOW FLOW.-The minimum instantaneous discharge occurring for the water year or for the designated period.

ANNUAL RUNOFF.-Indicates the total quantity of water in runoff for a drainage area for the year. Data reports may use any of the following units of measurement in presenting annual runoff data:

Acre-foot (AC-FT) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Cubic feet per square mile (CFSM) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming the runoff is distributed uniformly in time and area.

Inches (INCHES) indicate the depth to which the drainage area would be covered if all of the runoff for a given time period were uniformly distributed on it.

10 PERCENT EXCEEDS.-The discharge that has been exceeded 10 percent of the time for the designated period.

50 PERCENT EXCEEDS.-The discharge that has been exceeded 50 percent of the time for the designated period.

90 PERCENT EXCEEDS.-The discharge that has been exceeded 90 percent of the time for the designated period.

Data collected at partial-record stations follow the information for continuous-record sites. Data for partial-record discharge stations are presented in two tables. The first table lists annual maximum stage and discharge at crest-stage stations, and the second table lists discharge measurements at lowflow partial-record stations. The tables of partialrecord stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. These measurements are often made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for a special reason are called measurements at miscellaneous sites.

Identifying Estimated Daily Discharge

Estimated daily-discharge values published in the water-discharge tables of annual State data reports are identified. This identification is shown either by flagging individual daily values with the letter "e" and noting in a table footnote, "e- Estimated," or by listing the dates of the estimated record in the REMARKS paragraph of the station description.

Accuracy of Field Data and Computed Results

The accuracy of streamflow data depends primarily on (1) the stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements, and (2) the accuracy of observations of stage, measurements of discharge, and interpretations of records.

The degree of accuracy of the records is stated in the REMARKS in the station description. "Excellent" indicates that about 95 percent of the daily discharges are within 5 percent of the true value; "good" within 10 percent; and "fair," within 15 percent. "Poor" indicates that daily discharges have less than "fair" accuracy. Different accuracies may be attributed to different parts of a given record.

Values of daily mean discharge in this report are shown to the nearest hundredth of a cubic foot per second for discharges of less than 1 ft^3/s; to the nearest tenths between 1.0 and 10 ft^3/s; to whole numbers between 10 and 1,000 ft^3/s; and to three significant figures above 1,000 ft^3/s. The number of significant figures used is based solely on the magnitude of the discharge value. The same rounding rules apply to discharge values listed for partial-record stations.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, values of cubic feet per second per square mile and of runoff in inches are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

Other Data Records Available

Information of a more detailed nature than that published for most of the stream-gaging stations such as discharge measurements, gage-height records, and rating tables is available from the USGS Water Science Center. Also, most streamgaging station records are available in computer usable form and many statistical analyses have been made.

Information on the availability of unpublished data or statistical analyses may be obtained from the USGS Water Science Center in the state where the station is located.

Explanation of precipitation records

Data Collection and Computation

Rainfall data generally are collected using electronic data loggers that measure the rainfall in 0.01-inch increments every 15 minutes using either a tipping-bucket rain gage or a collection well gage. Twenty-four hour rainfall totals are tabulated and presented. A 24-hour period extends from just past midnight of the previous day to midnight of the current day. Snowfall-affected data can result during cold weather when snow fills the rain-gage funnel and then melts as temperatures rise. Snowfall-affected data are subject to errors. Missing values are indicated by this symbol "---" in the table.

Data Presentation

Precipitation records collected at surface-water gaging stations are identified with the same station number and name as the stream-gaging station. Where a surface-water daily-record station is not available, the precipitation record is published with its own name and latitude-longitude identification number.

Information pertinent to the history of a precipitation station is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, period of record, and general remarks. The following information is provided with each precipitation station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.-See Data Presentation in the EXPLANATION OF STAGE- AND WATERDISCHARGE RECORDS section of this report (same comments apply).

PERIOD OF RECORD.-See Data Presentation in the EXPLANATION OF STAGE- AND WATERDISCHARGE RECORDS section of this report (same comments apply).

INSTRUMENTATION.-Information on the type of rainfall collection system is given.

REMARKS.-Remarks provide added information pertinent to the collection, analysis, or computation of records.

Explanation of water-quality records

Collection and Examination of Data Surface-water samples for analysis usually are collected at or near stream-gaging stations. The quality-of-water records are given immediately following the discharge records at these stations. The descriptive heading for water-quality records gives the period of record for all water-quality data; the period of daily record for parameters that are measured on a daily basis (specific conductance, water temperature, sediment discharge, and so forth); extremes for the current year; and general remarks.

For ground-water records, no descriptive statements are given; however, the well number, depth of well, sampling date, or other pertinent data are given in the table containing the chemical analyses of the ground water.

Water Analysis

Most of the methods used for collecting and analyzing water samples are described in the TWRIs, which may be accessed from http:// water.usgs.gov/pubs/twri/.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary considerably with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled at several verticals to obtain a representative sample needed for an accurate mean concentration and for use in calculating load.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum and minimum values (and sometimes mean or median values) for each constituent measured and are based on 15-minute or 1-hour intervals of recorded data beginning at 0000 hours and ending at 2400 hours for the day of record.

Parameter Codes

See link.

Medium Codes

See link.

Surface-water-quality records

Records of surface-water quality ordinarily are obtained at or near stream-gaging stations because discharge data are useful in the interpretation of surface-water quality. Records of surface-water quality in this report involve a variety of types of data and measurement frequencies.

Classification of Records

Water-quality data for surface-water sites are grouped into one of three classifications. A continuous-record station is a site where data are collected on a regularly scheduled basis. Frequency may be one or more times daily, weekly, monthly, or quarterly. A partial-record station is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A miscellaneous sampling site is a location other than a continuous- or partial-record station, where samples are collected to give better areal coverage to define water-quality conditions in the river basin.

A careful distinction needs to be made between continuous records as used in this report and continuous recordings that refer to a continuous graph or a series of discrete values recorded at short intervals. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently. Locations of stations for which records on the quality of surface water appear in this report may be published as a USGS Annual Scientific Investigations Report by State, and may be accessed from http://pubs.usgs.gov, or the Related Information and Publications page of this Web Site.

Accuracy of the Records

One of four accuracy classifications is applied for measured physical properties at continuous-record stations on a scale ranging from poor to excellent. The accuracy rating is based on data values recorded before any shifts or corrections are made. Additional consideration also is given to the amount of publishable record and to the amount of data that have been corrected or shifted.

Arrangement of Records

Water-quality records collected at a surface-water daily record station are published immediately following that record, regardless of the frequency of sample collection. Station number and name are the same for both records. Where a surface-water daily record station is not available or where the water quality differs

significantly from that at the nearby surface-water station, the continuing water-quality record is published with its own station number and name in the regular downstream-order sequence. Water-quality data for partial-record stations and for miscellaneous sampling sites appear in separate tables following the table of discharge measurements at miscellaneous sites.

Onsite Measurements and Sample Collection

In obtaining water-quality data, a major concern is assuring that the data obtained represent the naturally occurring quality of the water. To ensure this, certain measurements, such as water temperature, pH, and dissolved oxygen, must be made onsite when the samples are collected. To assure that measurements made in the laboratory also represent the naturally occurring water, carefully prescribed procedures must be followed in collecting the samples, in treating the samples to prevent changes in quality pending analysis, and in shipping the samples to the laboratory. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in TWRIs Book 1, Chapter D2; Book 3, Chapters A1, A3, and A4; and Book 9, Chapters A1-A9. Most of the methods used for collecting and analyzing water samples are described in the TWRIs, which may be accessed from http://water.usgs.gov/pubs/twri/. Also, detailed information on collecting, treating, and shipping samples can be obtained from the USGS Water Science Center.

Rating the accuracy of continuous water-quality records
[≤, less than or equal to; ±, plus or minus value shown; °C, degree Celsius; >, greater than; %, percent; mg/L, milligram per liter; pH unit, standard pH unit]

Measured field parameter	**Ratings of accuracy (Based on combined fouling and calibration drift corrections applied to the record)**			
	Excellent	**Good**	**Fair**	**Poor**
Water temperature	≤ ± 0.2 °C	> ± 0.2 - 0.5 °C	> ± 0.5 - 0.8 °C	> ± 0.8 °C
Specific conductance	≤ ± 3%	> ± 3 - 10%	> ± 10 - 15%	> ± 15%
Dissolved oxygen	≤ ± 0.3 mg/L or ≤ ± 5%, whichever is greater	> ± 0.3 - 0.5 mg/L or > ± 5 - 10%, whichever is greater	> ± 0.5 - 0.8 mg/L or > ± 10 - 15%, whichever is greater	> ± 0.8 mg/L or > ± 15%, whichever is greater
pH	≤ ± 0.2 units	> ± 0.2 - 0.5 units	> ± 0.5 - 0.8 units	> ± 0.8 units
Turbidity	≤ ± 0.5 turbidity units or ≤ ± 5%, whichever is greater	> ± 0.5 - 1.0 turbidity units or > ± 5 - 10%, whichever is greater	> ± 1.0 - 1.5 turbidity units or > ± 10 - 15%, whichever is greater	> ± 1.5 turbidity units or > ± 15%, whichever is greater

Water Temperature

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at the time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same

time each day. Large streams have a small diurnal temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published. Water temperatures measured at the time of water discharge-measurements are on file in the USGS Water Science Center in the State where the station is located.

Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross section.

During periods of rapidly changing flow or rapidly changing concentration, samples may be collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration are computed by the subdivided-day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method. For periods when no samples were collected, daily discharges of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples are collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observation, such data are useful in establishing seasonal relations between quality and streamflow and in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of suspended-sediment discharge, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included for some stations.

Laboratory Measurements

Samples for biochemical oxygen demand (BOD) and indicator bacteria are analyzed locally. All other samples are analyzed in the USGS laboratory in Lakewood, Colorado, unless otherwise noted. Methods used in analyzing sediment samples and computing sediment records are given in TWRI, Book 5, Chapter C1. Methods used by the USGS laboratories are given in the TWRIs, Book 1, Chapter D2; Book 3, Chapter C2; and Book 5, Chapters A1, A3, and A4. The TWRI publications may be accessed from http://water.usgs.gov/pubs/twri/. These methods are consistent with ASTM standards and generally follow ISO standards.

Data Presentation

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for parameters currently measured daily. Tables of chemical, physical, biological, radiochemical data, and so forth, obtained at a frequency less than daily are presented first. Tables of "daily values" of specific conductance, pH, water temperature, dissolved oxygen, and suspended sediment then follow in sequence.

In the descriptive headings, if the location is identical to that of the discharge gaging station, neither the LOCATION nor the DRAINAGE AREA statements are repeated. The following information is provided with each continuous-record station. Comments that follow clarify information presented under the various headings of the station description.

LOCATION.-See Data Presentation information in the EXPLANATION OF STAGE- AND WATER-DISCHARGE

RECORDS section of this report (same comments apply).

DRAINAGE AREA.-See Data Presentation information in the EXPLANATION OF STAGEAND WATER-DISCHARGE RECORDS section of this report (same comments apply).

PERIOD OF RECORD.-This indicates the time periods for which published water-quality records for the station are available. The periods are shown separately for records of parameters measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the parameters individually.

INSTRUMENTATION.-Information on instrumentation is given only if a water-quality monitor temperature record, sediment pumping sampler, or other sampling device is in operation at a station.

REMARKS.-Remarks provide added information pertinent to the collection, analysis, or computation of the records.

COOPERATION.-Records provided by a cooperating organization or obtained for the USGS by a cooperating organization are identified here. EXTREMES.-Maximums and minimums are given only for parameters measured daily or more frequently. For parameters measured weekly or less frequently, true maximums or minimums may not have been obtained. Extremes, when given, are provided for both the period of record and for the current water year.

REVISIONS.-Records are revised if errors in published water-quality records are discovered. Appropriate updates are made in the USGS distributed data system, NWIS, and subsequently to its Web-based national data system, NWISWeb (http://waterdata.usgs.gov/nwis). Users of USGS water-quality data are encouraged to obtain all required data from NWIS or NWISWeb to ensure that they have the most recent updates. Updates to the NWISWeb are made on an annual basis.

The surface-water-quality records for partialrecord stations and miscellaneous sampling sites are published in separate tables following the table of discharge measurements at miscellaneous sites. No descriptive statements are given for these records. Each station is published with its own station number and name in the regular downstream-order sequence.

Remark Codes

The following remark codes may appear with the water-quality data in this section:

Printed Output	Remark
E	Value is estimated.
>	Actual value is known to be greater than the value shown.
<	Actual value is known to be less than the value shown.
M	Presence of material verified, but not quantified.
N	Presumptive evidence of presence of material.
U	Material specifically analyzed for, but not detected.
A	Value is an average.
V	Analyte was detected in both the environmental sample and the associated blanks.
S	Most probable value.

Water-Quality Control Data

The USGS National Water Quality Laboratory collects quality-control data on a continuing basis to evaluate selected analytical methods to determine long-term method detection levels (LTMDLs) and laboratory reporting levels (LRLs). These values are re-evaluated each year on the basis of the most recent quality-control data and, consequently, may change from year to year.

This reporting procedure limits the occurrence of false positive error. Falsely reporting a concentration greater than the LT-MDL for a sample in which the analyte is not present is 1 percent or less. Application of the LRL limits the occurrence of false negative error. The chance of falsely reporting a nondetection for

a sample in which the analyte is present at a concentration equal to or greater than the LRL is 1 percent or less.

Accordingly, concentrations are reported as less than LRL for samples in which the analyte either was not detected or did not pass identification. Analytes detected at concentrations between the LT-MDL and the LRL and that pass identification criteria are estimated. Estimated concentrations will be noted with a remark code of "E." These data should be used with the understanding that their uncertainty is greater than that of data reported without the E remark code.

Data generated from quality-control (QC) samples are a requisite for evaluating the quality of the sampling and processing techniques as well as data from the actual samples themselves. Without QC data, environmental sample data cannot be adequately interpreted because the errors associated with the sample data are unknown. The various types of QC samples collected by a USGS Water Science Center are described in the following section. Procedures have been established for the storage of water-quality-control data within the USGS. These procedures allow for storage of all derived QC data and are identified so that they can be related to corresponding environmental samples. These data are not presented in this report but are available from the USGS Water Science Center in the State where the Station is located.

Blank Samples

Blank samples are collected and analyzed to ensure that environmental samples have not been contaminated in the overall data-collection process. The blank solution used to develop specific types of blank samples is a solution that is free of the analytes of interest. Any measured value signal in a blank sample for an analyte (a specific component measured in a chemical analysis) that was absent in the blank solution is believed to be due to contamination. Many types of blank samples are possible; each is designed to segregate a different part of the overall data-collection process. The types of blank samples potentially collected by USGS Water Science Centers are:

Field blank-A blank solution that is subjected to all aspects of sample collection, field processing preservation, transportation, and laboratory handling as an environmental sample.

Trip blank-A blank solution that is put in the same type of bottle used for an environmental sample and kept with the set of sample bottles before and after sample collection.

Equipment blank-A blank solution that is processed through all equipment used for collecting and processing an environmental sample (similar to a field blank but normally done in the more controlled conditions of the office).

Sampler blank-A blank solution that is poured or pumped through the same field sampler used for collecting an environmental sample.

Filter blank-A blank solution that is filtered in the same manner and through the same filter apparatus used for an environmental sample.

Splitter blank-A blank solution that is mixed and separated using a field splitter in the same manner and through the same apparatus used for an environmental sample.

Preservation blank-A blank solution that is treated with the sampler preservatives used for an environmental sample.

Reference Samples

Reference material is a solution or material prepared by a laboratory. The reference material composition is certified for one or more properties so that it can be used to assess a measurement method. Samples of reference material are submitted for analysis to ensure that an analytical method is accurate for the known properties of the reference material. Generally, the selected reference material properties are similar to the environmental sample properties.

Replicate Samples

Replicate samples are a set of environmental samples collected in a manner such that the samples are thought to be essentially identical in composition. Replicate is the general case for which a duplicate is the special case consisting of two samples. Replicate samples are collected and analyzed to establish the amount of variability in the data contributed by some part of the collection and analytical process. Many types of replicate samples are possible, each of which may yield slightly different results in a dynamic hydrologic setting, such as a flowing stream. The types of replicate samples collected in this district are:

Concurrent samples-A type of replicate sample in which the samples are collected simultaneously with two or more samplers or by using one sampler and alternating the collection of samples into two or more compositing containers.

Sequential samples-A type of replicate sample in which the samples are collected one after the other, typically over a short time.

Split sample-A type of replicate sample in which a sample is split into subsamples, each subsample contemporaneous in time and space.

Spike Samples

Spike samples are samples to which known quantities of a solution with one or more well-established analyte concentrations have been added. These samples are analyzed to determine the extent of matrix interference or degradation on the analyte concentration during sample processing and analysis.

Explanation of ground-water level records

Generally, only ground-water-level data from selected wells with continuous recorders from a basic network of observation wells are published in this report. This basic network contains observation wells located so that the most significant data are obtained from the fewest wells in the most important aquifers.

Site Identification Numbers

Each well is identified by means of (1) a 15- digit number that is based on latitude and longitude and (2) a local number that is produced for local needs. See NUMBERING SYSTEM FOR WELLS AND MISCELLANEOUS SITES in this report for a detailed explanation.

Data Collection and Computation

Measurements are made in many types of wells, under varying conditions of access and at different temperatures; hence, neither the method of measurement nor the equipment can be standardized. At each observation well, however, the equipment and techniques used are those that will ensure that measurements at each well are consistent.

Most methods for collecting and analyzing water samples are described in the TWRIs referred to in the Onsite Measurements and Sample Collection and the Laboratory Measurements sections in this report. In addition, TWRI Book 1, Chapter D2, describes guidelines for the collection and field analysis of ground-water samples for selected unstable constituents. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in TWRIs Book 1, Chapter D2; Book 3, Chapters A1, A3, and A4; and Book 9, Chapters A1 through A9. The TWRI publications may be accessed from http://water.usgs.gov/pubs/twri/. The values in this report represent water-quality conditions at the time of sampling, as much as possible, and that are consistent with available sampling techniques and methods of analysis. These methods are consistent with ASTM standards and generally follow ISO standards. Trained personnel collected all samples. The wells sampled were pumped long enough to ensure that the water collected came directly from the aquifer and had not stood for a long time in the well casing where it would have been exposed to the atmosphere and to the material, possibly metal, comprising the casings.

Water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the

elevation of the land-surface datum above sea level is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (EOM).

Water levels are reported to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth of water of several hundred feet, the error in determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water the accuracy is greater. Accordingly, most measurements are reported to a hundredth of a foot, but some are given only to a tenth of a foot or a larger unit.

Data Presentation

Water-level data are presented in alphabetical order by county. The primary identification number for a given well is the 15-digit site identification number that appears in the upper left corner of the table. The secondary identification number is the local or county well number. Well locations are shown and each well is identified by its local well or county well number on a map in the local Water Science Center's Annual Scientific Investigation Report by State, and may be accessed from. . .

Each well record consists of three parts: the well description, the data table of water levels observed during the water year, and, for most wells, a hydrograph following the data table. Well descriptions are presented in the headings preceding the tabular data. The following comments clarify information presented in these various headings.

LOCATION.-This paragraph follows the well-identification number and reports the hydrologic-unit number and a geographic point of reference. Latitudes and longitudes used in this report are reported as North American Datum of 1927 unless otherwise specified.

AQUIFER-.This entry designates by name and geologic age the aquifer that the well taps.

WELL CHARACTERISTICS-.This entry describes the well in terms of depth, casing diameter and depth or screened interval, method of construction, use, and changes since construction.

INSTRUMENTATION-.This paragraph provides information on both the frequency of measurement and the collection method used, allowing the user to better evaluate the reported water-level extremes by knowing whether they are based on continuous, monthly, or some other frequency of measurement.

DATUM-.This entry describes both the measuring point and the land-surface elevation at the well. The altitude of the land-surface datum is described in feet above the altitude datum; it is reported with a precision depending on the method of determination. The measuring point is described physically (such as top of casing, top of instrument shelf, and so forth), and in relation to land surface (such as 1.3 ft above land-surface datum). The elevation of the land-surface datum is described in feet above National Geodetic Vertical Datum of 1929 (NGVD 29); it is reported with a precision depending on the method of determination.

REMARKS-.This entry describes factors that may affect the water level in a well or the measurement of the water level, when various methods of measurement were begun, and the network (climatic, terra ne, local, or areal effects) or the special project to which the well belongs.

PERIOD OF RECORD.-This entry indicates the time period for which records are published for the well, the month and year at the start of publication of water-level records by the USGS, and the words "to current year" if the records are to be continued into the following year. Time periods for which water-level records are available, but are not published by the USGS, may be noted.

EXTREMES FOR PERIOD OF RECORD.-This entry contains the highest and lowest instantaneously recorded or measured water levels of the period of published record, with respect to land-surface datum or sea level, and the dates of occurrence.

Water-Level Tables

A table of water levels follows the well description for each well. Water-level measurements in this report are given in feet with reference to either sea level or land-surface datum (lsd). Missing records are indicated by dashes in place of the water-level value.

For wells not equipped with recorders, water-level measurements were obtained periodically by steel or electric tape. Tables of periodic water-level measurements in these wells show the date of measurement and the measured water-level value.

Hydrographs

Hydrographs are a graphic display of water-level fluctuations over a period of time. In this report, current water year and, when appropriate, period-of-record hydrographs are shown.

Hydrographs that display periodic water-level measurements show points that may be connected with a dashed line from one measurement to the next. Hydrographs that display recorder data show a solid line representing the mean water level recorded for each day. Missing data are indicated by a blank space or break in a hydrograph. Missing data may occur as a result of recorder malfunctions, battery failures, or mechanical problems related to the response of the recorder's float mechanism to water-level fluctuations in a well.

Ground-water-quality data

Data Collection and Computation

The ground-water-quality data in this report were obtained as a part of special studies in specific areas. Consequently, a number of chemical analyses are presented for some wells within a county but not for others. As a result, the records for this year, by themselves, do not provide a balanced view of ground-water quality statewide. Most methods for collecting and analyzing water samples are described in the TWRIs, which may be accessed from http://water.usgs.gov/pubs/twri/. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in TWRI, Book 1, Chapter D2; Book 5, Chapters A1, A3, and A4; and Book 9, Chapters A1-A6. Also, detailed information on collecting, treating, and shipping samples may be obtained from the local USGS Water Science Center.

Laboratory Measurements

Analysis for sulfide and measurement of alkalinity, pH, water temperature, specific conductance, and dissolved oxygen are performed onsite. All other sample analyses are performed at the USGS laboratory in Lakewood, Colorado, unless otherwise noted. Methods used by the USGS laboratory are given in TWRI, Book 1, Chapter D2 and Book 5, Chapters A1, A3, and A4, which may be accessed from http://water.usgs.gov/pubs/twri/.

07121500 TIMPAS CREEK AT MOUTH NEAR SWINK, CO

Upper Arkansas Basin
Upper Arkansas-Lake Meredith Subbasin

LOCATION.--Lat 38°00′11″, long 103°39′20″ referenced to North American Datum of 1927, in NW ¼ SW ¼ sec.35, T.23 S., R.56 W., Otero County, CO, Hydrologic Unit 11020005, on right bank at downstream side of 23rd Road bridge, 1.7 mi southwest of Swink, and 2.9 mi upstream from mouth.

DRAINAGE AREA.--496 mi^2.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--January 1922 to September 1925, March 1968 to current year. Monthly discharge only for some periods, published in WSP 1311.

REVISED RECORDS.--WDR CO 76-1: 1975.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Elevation of gage is 4,120 ft above NGVD of 1929, from topographic map. Jan. 1922 to Sept. 1925 at several sites downstream at different datum. Mar. 1968 to May 29, 1975, at site 140 ft downstream at datum 0.13 ft lower. May 30, 1975 to Nov. 25, 1980, at site on left bank at same datum.

REMARKS.—No estimated daily discharges. Records fair except for those over 200 ft^3/s, which are poor. Natural flow of stream affected by erosion-control and livestock-watering reservoirs, diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas and from Catlin and Rocky Ford Highline Canals.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1922, 21,400 ft^3/s, June 17, 1965, gage height unknown.

07121500 TIMPAS CREEK AT MOUTH NEAR SWINK, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	79	144	22	17	15	14	102	95	77	70	108	57
2	85	154	21	17	14	13	84	102	76	70	106	66
3	83	148	21	17	14	13	89	98	82	71	110	57
4	72	142	21	16	15	13	87	99	78	73	120	62
5	69	141	21	16	15	13	91	93	78	75	176	63
6	68	140	21	16	14	13	120	70	82	74	126	42
7	70	135	20	16	15	13	103	66	85	71	114	40
8	74	129	20	16	15	14	85	64	94	75	127	44
9	78	123	20	16	14	15	83	64	91	76	136	44
10	74	106	20	16	14	14	83	69	91	73	121	37
11	89	108	20	16	14	13	70	72	101	80	109	34
12	98	113	20	16	15	13	74	75	101	109	111	33
13	99	100	19	16	16	13	57	80	118	100	102	32
14	100	93	19	16	15	13	63	78	154	85	98	31
15	93	73	19	16	14	20	66	74	168	73	95	35
16	95	37	19	16	14	77	114	70	160	74	90	36
17	90	32	19	16	14	100	155	71	138	71	81	36
18	81	29	19	16	14	113	146	88	133	74	76	36
19	75	29	18	15	14	117	138	86	123	75	72	36
20	76	31	18	16	13	124	113	89	102	147	72	36
21	120	27	18	15	14	130	99	85	88	297	70	36
22	149	26	18	15	13	141	96	78	90	98	73	36
23	144	25	18	15	13	133	79	74	82	93	76	37
24	145	24	18	14	13	139	81	77	78	111	77	35
25	157	24	17	14	13	133	108	98	72	129	72	34
26	151	23	18	15	13	137	118	84	69	118	71	34
27	145	23	17	14	13	138	110	84	66	112	70	35
28	134	23	17	15	13	137	103	80	70	106	74	38
29	130	22	17	15	---	139	111	80	75	78	72	38
30	128	22	17	15	---	127	106	67	72	65	67	35
31	143	---	17	15	---	112	---	74	---	97	58	---
Total	3,194	2,246	589	484	393	2,204	2,934	2,484	2,894	2,920	2,930	1,215
Mean	103	74.9	19.0	15.6	14.0	71.1	97.8	80.1	96.5	94.2	94.5	40.5
Max	157	154	22	17	16	141	155	102	168	297	176	66
Min	68	22	17	14	13	13	57	64	66	65	58	31
Ac-ft	6,340	4,450	1,170	960	780	4,370	5,820	4,930	5,740	5,790	5,810	2,410

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1922 - 2010, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	84.8	71.4	31.1	21.3	27.5	56.7	65.7	76.0	81.9	73.7	83.8	68.9
Max	265	210	109	60.4	84.6	201	170	187	318	200	401	159
(WY)	(1924)	(1924)	(1971)	(1923)	(1924)	(1924)	(1924)	(1995)	(1923)	(1923)	(1923)	(1986)
Min	9.21	12.8	5.22	5.34	6.10	15.9	11.0	14.0	21.9	13.0	10.6	9.60
(WY)	(2003)	(2004)	(2004)	(2004)	(2004)	(2004)	(1978)	(1981)	(2002)	(2002)	(2002)	(2002)

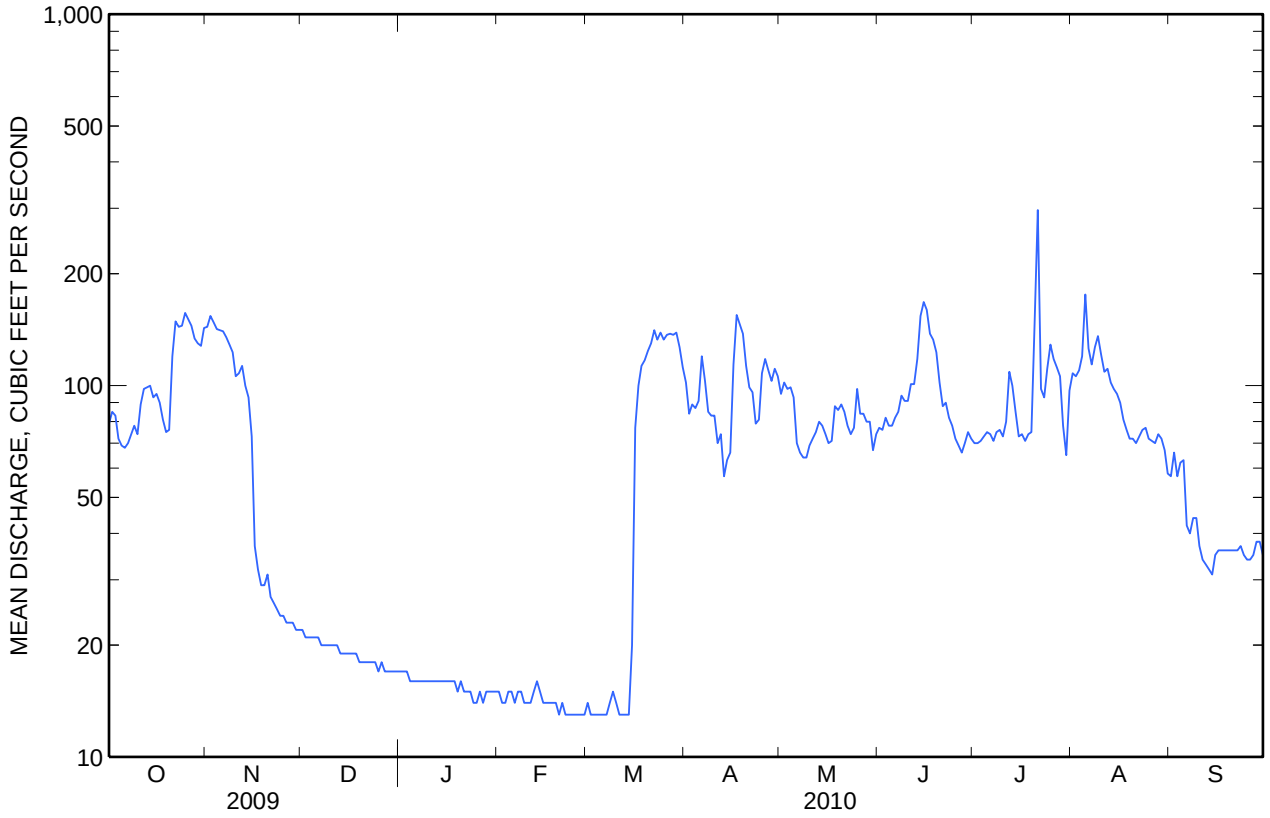
07121500 TIMPAS CREEK AT MOUTH NEAR SWINK, CO—Continued

SUMMARY STATISTICS

	Calendar Year 2009		Water Year 2010		Water Years 1922 - 2010	
Annual total	25,094		24,487			
Annual mean	68.8		67.1		62.1	
Highest annual mean					130	1923
Lowest annual mean					23.7	2002
Highest daily mean	684	Aug 19	297	Jul 21	2,670	Aug 17, 1923
Lowest daily mean	10	Mar 5	13	Feb 20	3.3	Aug 7, 1977
Annual seven-day minimum	11	Mar 4	13	Feb 22	4.9	Dec 1, 2003
Maximum peak flow			711	Jul 20	[a]12,300	Jul 10, 1978
Maximum peak stage			9.28	Jul 20	[b]21.11	Jul 10, 1978
Annual runoff (ac-ft)	49,770		48,570		44,980	
10 percent exceeds	130		130		120	
50 percent exceeds	71		72		49	
90 percent exceeds	13		15		14	

[a] From contracted-opening measurement of peak flow.

[b] From floodmark.



07124000 ARKANSAS RIVER AT LAS ANIMAS, CO

Upper Arkansas Basin
Upper Arkansas-John Martin Reservoir Subbasin

LOCATION.--Lat 38°04′51″, long 103°13′09″ referenced to North American Datum of 1927, in SE ¼ NE ¼ sec.3, T.23 S., R.52 W., Bent County, CO, Hydrologic Unit 11020009, on right bank at upstream side of bridge on U.S. Highway 50, 1.1 mi north of courthouse in Las Animas, and 4.2 mi upstream from Purgatoire River.

DRAINAGE AREA.--14,417 mi^2 of which 441 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--May to November 1898 (gage heights only), August to November 1909 (gage heights and discharge measurements only), May 1939 to current year. Statistical summary computed for 1975 to current year, subsequent to partial regulation by Pueblo Reservoir.

REVISED RECORDS.--WSP 1341: Drainage area.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Datum of gage is 3,883.97 ft above NGVD of 1929. May 13 to Nov. 12, 1898, and Aug. 1 to Nov. 10, 1909, nonrecording gages near present site at different datums. May 23, 1939 to Apr. 27, 1967, water-stage recorder at site 0.4 mi downstream at datum 9.00 ft lower.

REMARKS.--Records good except for estimated daily discharges, which are poor. Natural flow of stream affected by storage reservoirs, power developments, transbasin and transmountain diversions, diversions for irrigation and municipal use, groundwater withdrawals, return flows from irrigated areas, and flows from sewage-treatment plants. Flow partly regulated by Pueblo Reservoir (station 07099350) about 104 mi upstream since Jan. 9, 1974.

07124000 ARKANSAS RIVER AT LAS ANIMAS, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	76	91	162	127	115	133	103	152	555	225	134	60
2	66	77	163	124	118	135	92	194	757	286	336	53
3	60	79	162	123	124	141	101	417	700	375	238	53
4	59	77	159	128	140	148	172	520	569	435	242	47
5	68	73	157	133	144	149	163	467	386	440	562	44
6	69	68	e155	e134	137	143	109	332	383	308	775	38
7	63	64	e150	e135	136	136	143	201	536	252	489	33
8	57	71	e145	e121	133	150	105	225	600	208	254	36
9	57	73	e140	e111	130	176	76	309	1,010	245	344	37
10	65	62	e140	e117	123	161	64	367	1,250	293	263	38
11	70	65	e140	127	120	138	59	321	1,560	310	303	39
12	81	65	e140	128	118	132	50	305	1,350	321	358	32
13	82	61	e145	126	113	213	43	246	1,280	207	261	32
14	105	400	e150	123	110	271	66	205	1,410	206	232	31
15	139	658	e152	121	109	220	60	259	1,330	180	331	29
16	175	415	156	119	110	99	48	314	1,140	157	412	28
17	186	291	148	119	112	79	222	291	944	127	464	30
18	159	251	148	117	109	80	134	290	684	96	470	29
19	133	229	146	116	113	79	107	293	703	68	261	38
20	127	200	142	115	124	77	90	284	503	69	213	169
21	153	182	139	112	133	66	113	186	418	91	203	228
22	200	172	131	114	140	134	98	232	426	174	168	260
23	162	176	131	116	144	103	79	277	417	204	149	299
24	149	193	129	117	139	e70	101	349	444	286	136	402
25	156	201	123	118	138	179	111	426	411	226	112	404
26	167	198	e132	121	139	200	103	445	347	176	114	382
27	157	192	136	122	133	153	214	362	311	170	168	276
28	190	182	127	122	128	238	359	430	402	158	121	225
29	201	179	120	114	---	256	298	319	334	136	81	123
30	139	167	138	117	---	253	174	203	268	120	63	84
31	103	---	141	114	---	178	---	203	---	112	57	---
Total	3,674	5,212	4,447	3,751	3,532	4,690	3,657	9,424	21,428	6,661	8,314	3,579
Mean	119	174	143	121	126	151	122	304	714	215	268	119
Max	201	658	163	135	144	271	359	520	1,560	440	775	404
Min	57	61	120	111	109	66	43	152	268	68	57	28
Med	127	174	142	121	126	143	103	293	562	206	242	45
Ac-ft	7,290	10,340	8,820	7,440	7,010	9,300	7,250	18,690	42,500	13,210	16,490	7,100

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1975 - 2010, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	146	142	140	170	175	117	113	525	801	446	293	113
Max	1,092	810	398	641	761	422	877	4,043	4,263	3,339	1,343	373
(WY)	(1985)	(1998)	(1998)	(1998)	(1985)	(1998)	(1987)	(1999)	(1995)	(1995)	(1999)	(1984)
Min	5.13	6.05	8.40	8.45	18.5	9.44	10.8	14.1	16.8	10.0	14.5	9.12
(WY)	(1978)	(1975)	(1978)	(1978)	(1978)	(1975)	(1978)	(1981)	(2002)	(2002)	(2002)	(1977)

07124000 ARKANSAS RIVER AT LAS ANIMAS, CO—Continued

SUMMARY STATISTICS

	Calendar Year 2009		Water Year 2010		Water Years 1975 - 2010	
Annual total	80,952		78,369			
Annual mean	222		215		[a]265	
Highest annual mean					841	1995
Lowest annual mean					59.8	2002
Highest daily mean	1,190	Jun 5	1,560	Jun 11	[b]22,600	May 3, 1999
Lowest daily mean	26	Mar 26	28	Sep 16	[c]3.0	Nov 30, 1974
Annual seven-day minimum	28	Mar 21	30	Sep 12	4.1	Sep 26, 1977
Maximum peak flow			1,720	Jun 11	[d]32,900	May 2, 1999
Maximum peak stage			8.49	Jun 11	[f]14.02	May 2, 1999
Annual runoff (ac-ft)	160,600		155,400		192,300	
10 percent exceeds	540		416		537	
50 percent exceeds	139		144		117	
90 percent exceeds	51		65		17	

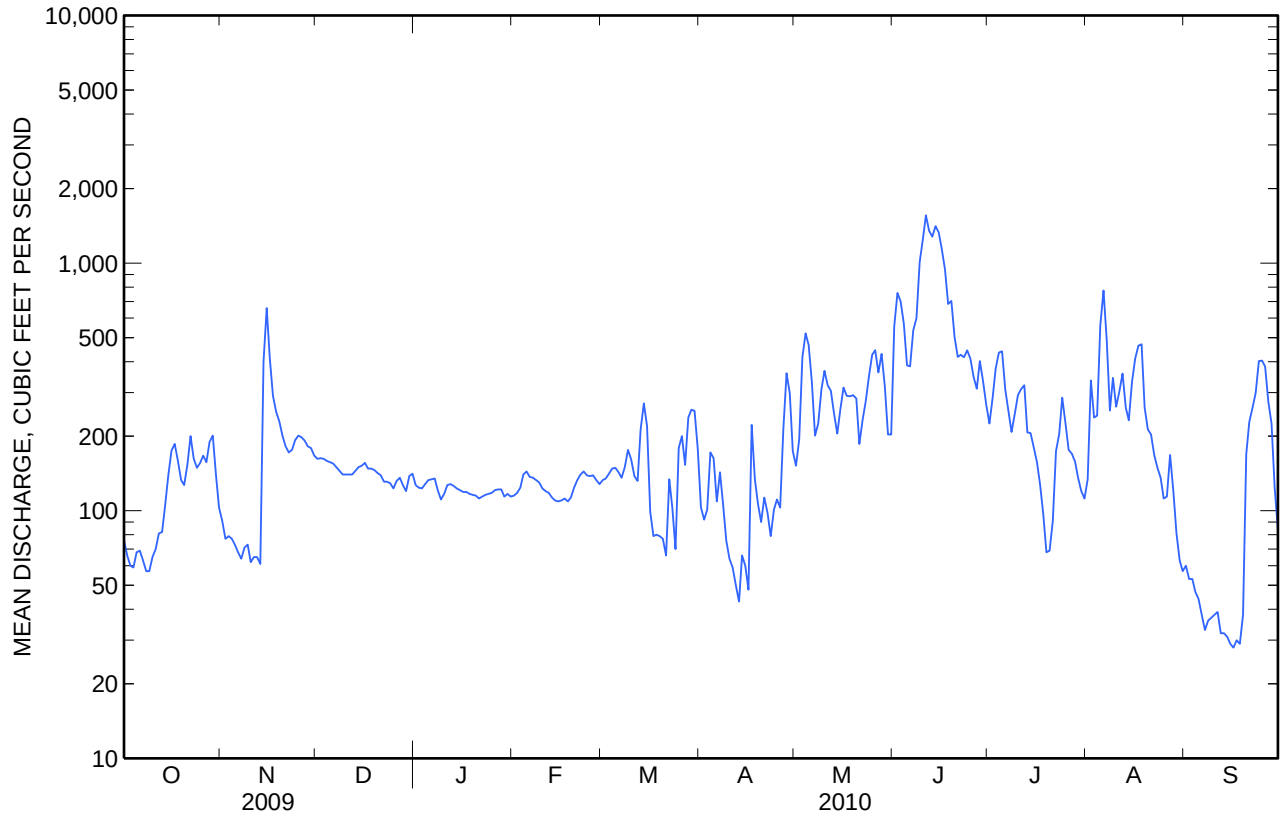
[a] Average discharge for 34 years (water years 1940-73), 203 ft³/s; 147,100 acre-ft/yr, prior to completion of Pueblo Dam.

[b] Maximum daily discharge for period of record, 25,800 ft³/s, May 20, 1955.

[c] Minimum daily discharge for period of record, 0.9 ft³/s, Jul 31, Aug 1 and 3, 1964.

[d] From rating curve extended above 21,600 ft³/s; maximum discharge and stage for period of record, 44,000 ft³/s, May 20, 1955, gage height, 15.03 ft, from current-meter measurement and slope-area measurement of over-flow channel, site and datum then in use.

[f] From floodmark.



07130500 ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR, CO

Upper Arkansas Basin
Upper Arkansas-John Martin Reservoir Subbasin

LOCATION.--Lat 38°03′59″, long 102°55′55″ referenced to North American Datum of 1927, in NW ¼ NE ¼ sec.8, T.23 S., R.49 W., Bent County, CO, Hydrologic Unit 11020009, on right bank 0.2 mi downstream from John Martin Dam, 2.6 mi upstream from Caddoa Creek, and 3.5 mi southeast of Hasty.

DRAINAGE AREA.--18,915 mi^2 of which 785 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--April 1938 to current year. Published as "at Caddoa" prior to October 1947. Statistical summary computed for 1949 to current year, subsequent to completion of John Martin Reservoir.

REVISED RECORDS.--WSP 1241: 1942 (M). WSP 1341: Drainage area.

GAGE.--Water-stage recorder with satellite telemetry, concrete control, and crest-stage gage. Datum of gage is 3,737.40 ft above NGVD of 1929. Prior to Feb. 22, 1940, at site 3 mi upstream at datum 22.83 ft higher. Feb. 22, 1940 to Feb. 4, 1943, at site 700 ft upstream at datum 3.64 ft higher. Feb. 5, 1943 to Apr. 8, 1975, at site 1.5 mi downstream at datum approximately 27.5 ft lower.

REMARKS.--Records good except for estimated daily discharges and those below 3 ft^3/s, which are poor. Natural flow of stream affected by storage reservoirs, power developments, transbasin and transmountain diversions, diversions for irrigation and municipal use, groundwater withdrawals, return flows from irrigated areas, and flows from sewage-treatment plants. Flow completely regulated by John Martin Reservoir (station 07130000) 0.2 mi upstream since Oct. 1948.

07130500 ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	153	9.6	e1.0	e0.93	e0.93	e0.90	179	493	511	1,220	449	383
2	107	1.9	e1.0	e0.93	e0.96	e0.90	108	482	616	1,160	446	103
3	77	1.6	e1.0	e0.93	e0.97	e0.90	109	429	682	1,140	446	68
4	77	1.3	e1.0	e0.93	e0.99	e0.90	143	475	641	1,130	447	68
5	80	1.3	e1.0	e0.93	e1.00	e0.90	164	473	596	1,130	533	68
6	82	1.3	e1.0	e0.93	e1.0	e0.90	165	551	597	1,330	661	68
7	83	1.2	e1.0	e0.90	e1.0	e0.90	163	621	595	1,490	715	62
8	87	1.2	e1.0	e0.85	e0.98	e0.90	164	531	591	1,280	719	51
9	94	1.3	e0.96	e0.80	e0.96	e0.90	164	470	770	1,120	715	41
10	93	1.2	e0.90	e0.80	e0.96	e0.90	165	471	922	1,110	593	37
11	94	1.1	e0.90	e0.80	e0.96	e0.90	165	481	951	1,110	490	38
12	124	1.1	e0.90	e0.83	e0.95	e0.90	191	475	963	1,100	468	37
13	154	1.1	e0.97	e0.90	e0.95	e0.90	212	462	964	1,110	469	37
14	187	1.1	e1.00	e0.91	e0.93	e0.90	449	460	958	1,120	470	37
15	202	1.5	e1.00	e0.91	e0.92	e0.90	451	461	937	1,110	472	37
16	214	1.1	e1.00	e0.91	e0.90	e0.90	435	461	915	1,100	473	37
17	254	1.1	e1.00	e0.91	e0.90	e0.90	432	453	1,300	1,090	482	37
18	320	1.1	e1.00	e0.92	e0.90	e0.90	433	473	1,570	663	575	37
19	325	1.1	e1.00	e0.92	e0.90	e0.90	483	531	1,490	460	640	37
20	322	1.1	e1.00	e0.92	e0.90	e0.90	531	684	1,480	463	540	37
21	351	1.1	e1.00	e0.92	e0.90	e0.90	560	641	1,380	453	480	37
22	400	1.1	e1.00	e0.92	e0.90	e0.90	567	512	1,240	432	472	36
23	384	e1.0	e1.00	e0.92	e0.90	e0.90	556	464	1,210	455	443	36
24	384	e1.1	e0.99	e0.92	e0.90	e0.90	566	453	1,220	472	428	36
25	383	1.1	e0.94	e0.91	e0.90	e0.90	569	472	1,170	454	426	37
26	369	1.1	e0.91	e0.89	e0.90	e0.90	569	501	1,180	440	447	37
27	348	1.1	e0.92	e0.89	e0.90	e0.90	570	507	1,180	434	440	37
28	350	1.1	e0.92	e0.89	e0.90	e0.90	569	509	1,200	436	424	33
29	332	1.1	e0.92	e0.89	---	e0.90	555	511	1,300	441	423	29
30	315	1.1	e0.92	e0.89	---	e0.90	514	510	1,310	447	417	29
31	315	---	e0.92	e0.90	---	e95	---	510	---	451	419	---
Total	7,060	44.2	30.07	27.80	26.16	122.00	10,901	15,527	30,439	26,351	15,622	1,667
Mean	228	1.47	0.97	0.90	0.93	3.94	363	501	1,015	850	504	55.6
Max	400	9.6	1.0	0.93	1.0	95	570	684	1,570	1,490	719	383
Min	77	1.0	0.90	0.80	0.90	0.90	108	429	511	432	417	29
Ac-ft	14,000	88	60	55	52	242	21,620	30,800	60,380	52,270	30,990	3,310

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1949 - 2010, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	194	22.9	14.9	17.4	20.5	49.3	403	487	608	711	537	307
Max	565	217	317	725	477	498	1,174	2,576	2,665	2,895	2,127	1,007
(WY)	(1949)	(1966)	(1998)	(1998)	(1966)	(1998)	(1987)	(1987)	(1987)	(1995)	(1965)	(1984)
Min	11.4	0.85	0.64	0.62	0.75	1.06	2.43	34.2	52.0	86.1	22.6	6.69
(WY)	(1975)	(1977)	(1977)	(1977)	(1977)	(1980)	(1973)	(1975)	(1954)	(1963)	(1960)	(1974)

07130500 ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR, CO—Continued

SUMMARY STATISTICS

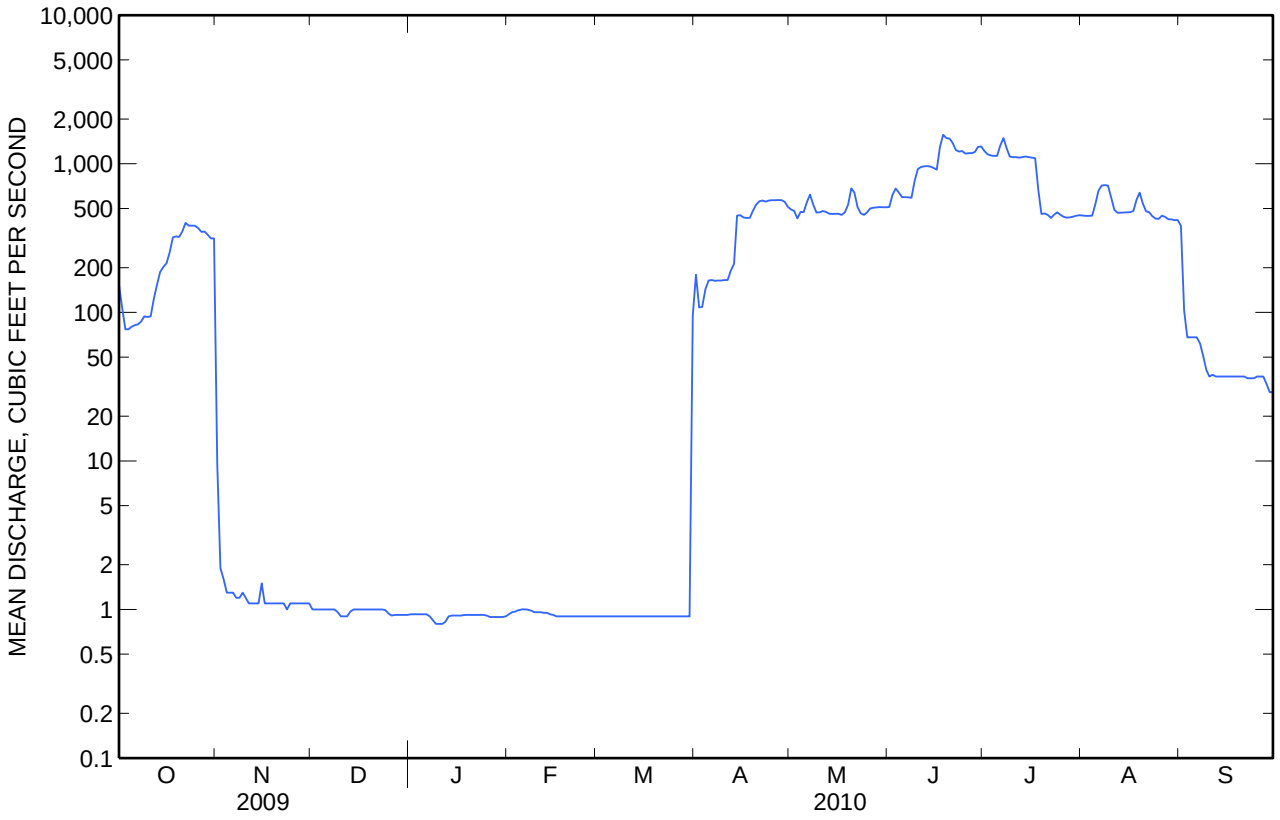
	Calendar Year 2009		Water Year 2010		Water Years 1949 - 2010	
Annual total	99,489.44		107,817.23			
Annual mean	273		295		[a]282	
Highest annual mean					745	1987
Lowest annual mean					82.5	1964
Highest daily mean	1,610	Jul 6	1,570	Jun 18	3,830	Aug 25, 1965
Lowest daily mean	0.74	Jan 4	0.80	Jan 9	[b]0.36	Dec 25, 1979
Annual seven-day minimum	0.92	Dec 25	0.84	Jan 7	0.36	Dec 25, 1979
Maximum peak flow			1,700	Jun 17	[c]4,100	Aug 25, 1965
Maximum peak stage			4.60	Jun 17	[d]5.75	Aug 25, 1965
Annual runoff (ac-ft)	197,300		213,900		204,600	
10 percent exceeds	679		928		853	
50 percent exceeds	87		83		59	
90 percent exceeds	1.0		0.90		1.6	

[a] Average discharge for 5 years (water years 1939-43), 628 ft³/s; 455,000 acre-ft/yr, prior to start of storage in John Martin Reservoir.

[b] Also occurred Dec 26, 1979 to Jan 3, 1980; no flow on many days during 1945-47. Minimum daily discharge prior to start of storage in John Martin Reservoir, 5 ft³/s, Jul 16, 1939.

[c] Maximum discharge for period of record, 40,000 ft³/s, Apr 24, 1942, from rating curve extended above 12,000 ft³/s on basis of flow-over-dam and critical-depth measurement of peak flow, gage height, 10.46 ft, site and datum then in use.

[d] Maximum gage height for period of record, 10.62 ft, Jun 18, 1965 (backwater from Caddoa Creek), site and datum then in use.



Water-Data Report 2010

07133000 ARKANSAS RIVER AT LAMAR, CO

Upper Arkansas Basin
Upper Arkansas-John Martin Reservoir Subbasin

LOCATION.--Lat 38°06′21″, long 102°37′05″ referenced to North American Datum of 1927, in NE ¼ SE ¼ sec.30, T.22 S., R.46 W., Prowers County, CO, Hydrologic Unit 11020009, on left bank at left downstream end of downstream bridge on U.S. Highways 50 and 287, and 1.3 mi north of courthouse in Lamar.

DRAINAGE AREA.--19,780 mi² of which 950 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--May 1913 to September 1955, April 1959 to current year. Monthly discharge only for some periods, published in WSP 1311. Statistical summary computed for 1949 to current year, subsequent to completion of John Martin Reservoir.

REVISED RECORDS.--WSP 1341: 1921 (M), 1945-46 (M), drainage area; WDR CO-86-1: 1985.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Datum of gage is 3,597.39 ft above NGVD of 1929. See WSP 1731 for history of changes prior to Apr. 4, 1959. Apr. 4, 1959 to Mar. 26, 1968, at site 525 ft upstream at datum 2.42 ft higher. Mar. 27, 1968 to Nov. 17, 1982, at site 375 ft downstream at datum 4.00 ft lower. Mar. 18, 1987 to Mar. 6, 2002, at site 75 ft upstream at same datum.

REMARKS.--Records good except for estimated daily discharges, which are poor. Natural flow of stream affected by storage reservoirs, power developments, transbasin and transmountain diversions, diversions for irrigation and municipal use, groundwater withdrawals, return flows from irrigated areas, and flows from sewage-treatment plants. Flow regulated by John Martin Reservoir (station 07130000) 21 mi upstream since Oct. 1948.

07133000 ARKANSAS RIVER AT LAMAR, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	7.8	69	30	e20	22	21	11	9.5	24	717	28	8.4
2	9.8	73	30	e20	e22	21	17	9.7	17	674	35	9.2
3	11	59	e30	e23	23	20	11	9.0	16	682	12	7.1
4	9.4	56	e28	26	25	e20	10	8.8	14	669	15	6.7
5	9.2	54	e27	25	21	e17	12	9.8	16	729	14	6.7
6	8.5	48	e28	e22	22	e11	10	10	24	685	15	6.8
7	7.8	43	e26	e19	22	e11	10	9.0	25	640	34	6.8
8	7.6	42	e26	e20	22	18	9.8	9.5	21	671	27	6.8
9	8.4	42	e25	e21	21	20	9.9	9.9	20	702	23	6.4
10	8.7	43	e25	e22	22	19	9.4	9.0	18	655	25	6.6
11	9.1	40	e26	23	22	18	8.6	9.6	41	652	17	6.8
12	9.0	38	30	24	22	17	8.0	9.4	51	648	14	6.5
13	9.5	40	30	e24	21	15	7.5	8.8	74	635	13	6.6
14	9.5	43	30	24	21	14	8.2	9.1	75	637	12	6.7
15	8.8	46	e27	24	21	14	8.7	9.3	75	652	12	7.0
16	8.7	37	e26	23	e22	15	7.9	9.4	55	663	12	7.0
17	9.4	37	e26	22	18	13	8.1	10	112	653	12	6.9
18	9.8	37	e27	22	18	11	7.5	9.7	617	517	11	7.4
19	10	37	29	22	19	11	7.7	12	763	121	12	7.2
20	11	36	28	22	19	11	7.8	22	791	72	13	6.5
21	22	34	e28	22	19	11	7.1	58	753	44	12	6.3
22	46	31	e27	22	19	11	8.0	11	728	33	11	6.6
23	43	33	e28	22	18	12	9.2	9.5	685	33	10	7.9
24	29	33	e28	19	20	14	8.7	10	705	27	11	6.3
25	25	29	e26	19	19	15	9.5	10	729	21	10	6.2
26	22	30	e26	19	18	18	9.7	16	677	18	10	6.3
27	20	31	e26	20	18	18	9.6	16	687	16	10	6.7
28	12	31	e25	20	19	15	9.0	12	688	15	7.9	6.6
29	10	31	e24	22	---	15	8.8	18	759	15	9.1	6.6
30	32	30	e23	21	---	13	10	20	771	15	8.2	7.0
31	49	---	e21	22	---	11	---	32	---	18	8.0	---
Total	493.0	1,233	836	676	575	470	279.7	416.0	10,031	12,329	463.2	206.6
Mean	15.9	41.1	27.0	21.8	20.5	15.2	9.32	13.4	334	398	14.9	6.89
Max	49	73	30	26	25	21	17	58	791	729	35	9.2
Min	7.6	29	21	19	18	11	7.1	8.8	14	15	7.9	6.2
Ac-ft	978	2,450	1,660	1,340	1,140	932	555	825	19,900	24,450	919	410

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1949 - 2010, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	35.6	21.5	28.1	36.9	37.8	39.1	149	181	264	320	194	80.9
Max	233	117	350	796	507	516	1,089	2,143	2,087	2,457	1,547	689
(WY)	(1949)	(1998)	(1998)	(1998)	(1966)	(1998)	(1987)	(1987)	(1987)	(1995)	(1965)	(1965)
Min	0.84	1.81	0.56	0.47	0.72	1.11	5.90	6.41	3.80	10.2	10.9	1.37
(WY)	(1978)	(1978)	(1978)	(1978)	(1965)	(1965)	(1995)	(1963)	(1954)	(1964)	(1974)	(1974)

07133000 ARKANSAS RIVER AT LAMAR, CO—Continued

SUMMARY STATISTICS

	Calendar Year 2009		Water Year 2010		Water Years 1949 - 2010	
Annual total	24,452.8		28,008.5			
Annual mean	67.0		76.7		[a]116	
Highest annual mean					537	1987
Lowest annual mean					17.7	2003
Highest daily mean	973	Jul 27	791	Jun 20	[b]25,000	Jun 18, 1965
Lowest daily mean	7.3	Feb 8	6.2	Sep 25	[c]0.00	Dec 5, 1953
Annual seven-day minimum	7.9	Feb 8	6.5	Sep 24	0.21	Jan 10, 1965
Maximum peak flow			827	Jul 5	[d]73,800	Jun 18, 1965
Maximum peak stage			8.02	Jul 5	[f]16.48	Jun 18, 1965
Annual runoff (ac-ft)	48,500		55,550		83,690	
10 percent exceeds	71		73		399	
50 percent exceeds	14		19		22	
90 percent exceeds	8.1		7.9		4.5	

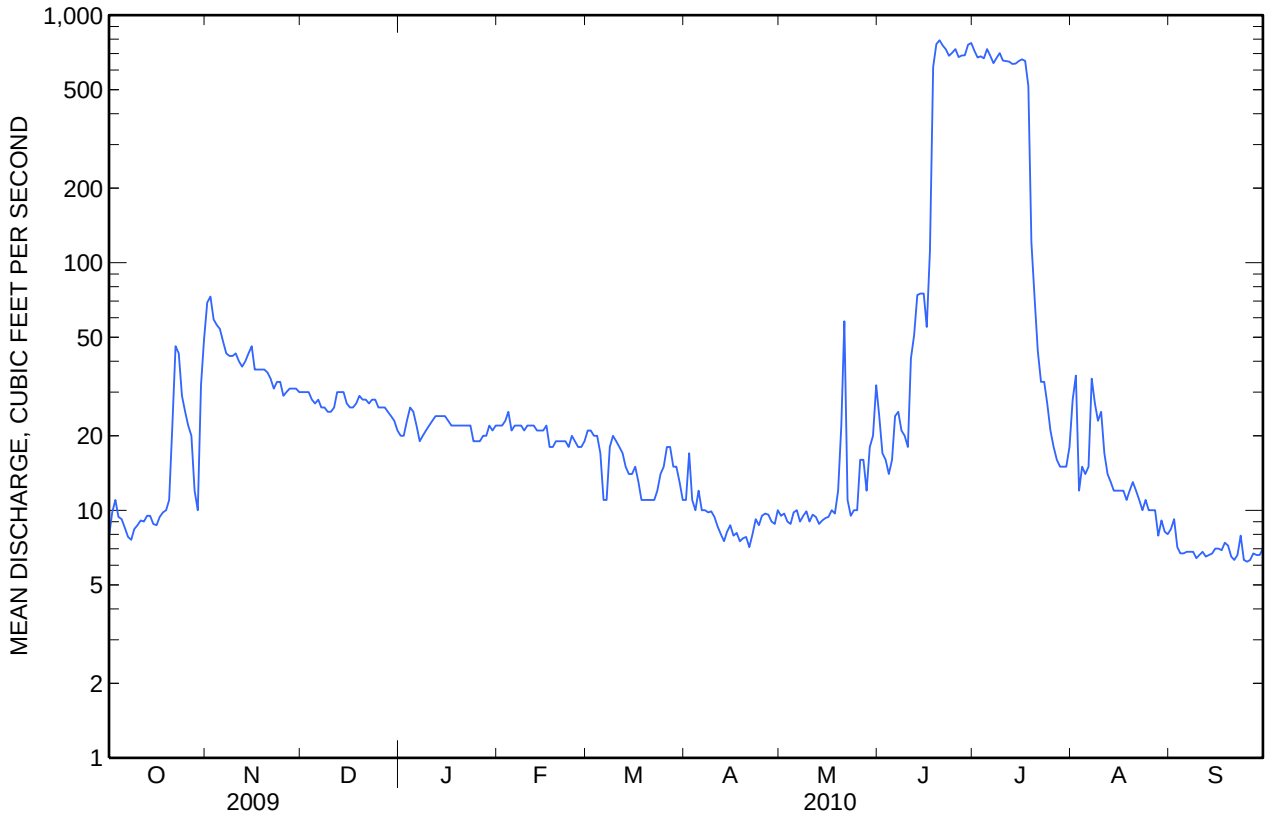
[a] Average discharge for 30 years (water years 1914-43), 298 ft³/s, 215,900 acre-ft/yr, prior to and during construction of John Martin Dam.

[b] Maximum daily discharge for period of record, 87,300 ft³/s, Jun 5, 1921.

[c] Also minimum daily discharge for period of record; also occurred at times in 1913-15.

[d] From current-meter and timed-drift measurement of peak flow, maximum discharge and gage height for period of record, 130,000 ft³/s (determined by Colorado State Engineer), Jun 5, 1921, from rating curve extended above 10,000 ft³/s, gage height, 14.55 ft, site and datum then in use.

[f] From floodmarks, site and datum then in use.



07134100 BIG SANDY CREEK NEAR LAMAR, CO

Upper Arkansas Basin
Big Sandy Subbasin

LOCATION.--Lat 38°06′51″, long 102°29′00″ referenced to North American Datum of 1927, in SW ¼ SW ¼ sec.21, T.22 S., R.45 W., Prowers County, CO, Hydrologic Unit 11020011, on right bank 35 ft upstream from State Highway 196, 950 ft upstream from mouth, and 7.5 mi east of Lamar.

DRAINAGE AREA.--3,248 mi^2 of which 585 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--February 1968 to September 1982, July 1995 to current year.

REVISED RECORDS.--WDR CO-01-1: Drainage area.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Elevation of gage is 3,545 ft above NGVD of 1929, from topographic map. Prior to June 30, 1977, at datum 1.00 ft higher.

REMARKS.--Records poor. Natural flow of stream affected by storage, erosion-control, and livestock-watering reservoirs, diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas. Flow affected by backwater from the Arkansas River at times.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 17, 1965, reached a discharge of 3,600 ft^3/s, from slope-area measurement of peak flow 0.5 mi upstream from station. Flood of Aug. 21, 1965, reached a stage of 9.93 ft, from floodmarks, discharge unknown.

07134100 BIG SANDY CREEK NEAR LAMAR, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	11	13	7.9	26	26	10	12	11	2.7	7.8	115	e9.4
2	12	11	8.0	26	25	12	9.9	8.2	3.7	11	49	e9.5
3	13	11	13	25	22	9.8	9.9	10	4.6	13	31	10
4	13	8.9	14	25	26	7.9	9.4	18	7.6	9.7	27	8.9
5	14	8.8	13	27	25	6.7	9.3	15	17	23	20	e8.8
6	13	8.8	17	27	24	6.2	7.4	12	11	16	18	e8.9
7	13	8.8	18	25	23	6.0	6.3	10	14	16	16	10
8	14	8.6	20	24	21	26	9.1	12	12	20	16	11
9	15	8.8	19	21	16	66	13	12	8.7	25	16	11
10	14	8.5	15	20	12	46	10	9.7	11	24	16	10
11	15	8.2	14	21	15	28	6.7	12	12	20	15	10
12	15	8.3	16	22	18	19	6.9	11	16	12	13	e9.3
13	14	8.2	18	20	16	14	9.2	16	20	9.8	8.3	e9.2
14	16	7.9	19	20	14	11	11	12	19	5.3	6.8	e8.9
15	13	8.7	19	21	11	10	8.9	13	30	5.9	4.6	9.0
16	12	9.6	19	21	7.3	10	17	13	24	22	5.9	10
17	12	10	19	21	8.9	10	25	6.8	21	13	6.6	10
18	11	10	20	22	16	11	11	7.5	14	7.7	8.8	9.7
19	12	9.7	20	23	16	11	11	13	17	5.5	10	9.6
20	13	8.7	20	22	11	11	9.3	16	23	5.1	7.6	9.0
21	27	8.0	21	21	9.0	11	10	12	16	5.3	7.9	9.0
22	41	7.5	22	24	6.5	11	9.5	16	17	4.5	10	9.5
23	36	7.5	21	26	4.5	11	14	14	15	5.4	19	13
24	26	11	19	23	8.3	14	13	11	13	5.7	9.9	9.8
25	22	8.6	20	20	11	15	20	19	10	5.1	11	11
26	20	8.1	19	17	7.1	20	29	16	7.6	5.3	15	11
27	20	7.9	17	17	6.5	17	25	18	7.1	4.5	13	e11
28	19	8.0	20	17	6.6	15	16	19	7.6	4.4	14	e11
29	12	8.0	22	17	---	13	13	18	7.0	3.4	13	e11
30	12	7.8	24	15	---	14	11	13	7.7	3.7	9.9	e11
31	14	---	25	19	---	14	---	8.0	---	41	9.4	---
Total	514	267.9	558.9	675	412.7	486.6	372.8	402.2	396.3	360.1	542.7	299.5
Mean	16.6	8.93	18.0	21.8	14.7	15.7	12.4	13.0	13.2	11.6	17.5	9.98
Max	41	13	25	27	26	66	29	19	30	41	115	13
Min	11	7.5	7.9	15	4.5	6.0	6.3	6.8	2.7	3.4	4.6	8.8
Ac-ft	1,020	531	1,110	1,340	819	965	739	798	786	714	1,080	594

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1968 - 2010, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	8.51	13.6	17.8	19.0	18.7	18.8	18.0	18.8	10.9	9.93	13.7	9.68
Max	28.4	58.9	63.0	75.5	55.6	59.0	70.6	166	42.9	41.6	85.3	41.8
(WY)	(1997)	(1998)	(1998)	(1998)	(1998)	(1998)	(1999)	(1999)	(1999)	(1998)	(1997)	(1976)
Min	0.09	0.41	0.34	0.50	2.23	2.10	0.81	2.14	1.77	0.21	0.03	0.08
(WY)	(1979)	(1978)	(1978)	(1978)	(1978)	(1977)	(1978)	(1975)	(1976)	(1978)	(1976)	(1978)

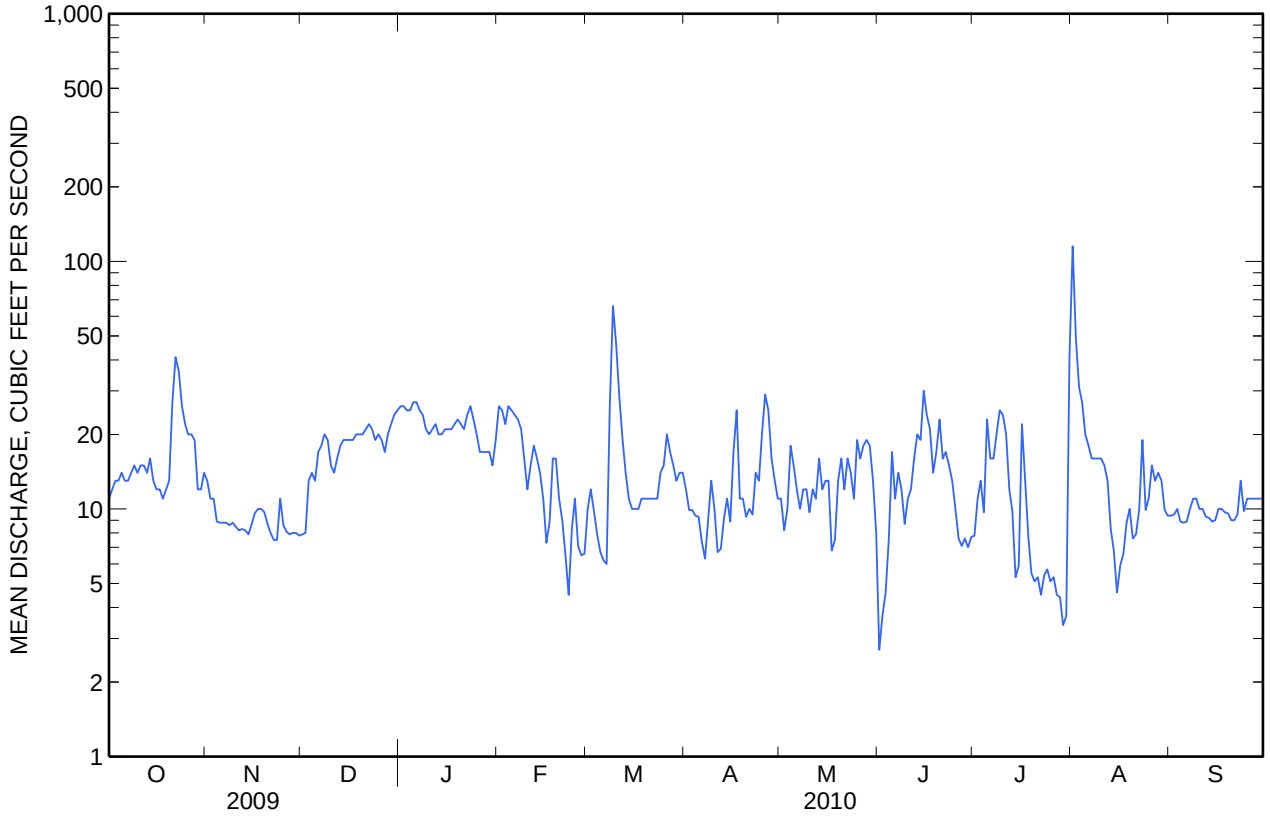
07134100 BIG SANDY CREEK NEAR LAMAR, CO—Continued

SUMMARY STATISTICS

	Calendar Year 2009		Water Year 2010		Water Years 1968 - 2010	
Annual total	4,598.0		5,288.7			
Annual mean	12.6		14.5		14.9	
Highest annual mean					45.6	1999
Lowest annual mean					2.23	1979
Highest daily mean	41	Oct 22	115	Aug 1	1,460	May 4, 1999
Lowest daily mean	4.8	Jul 14	2.7	Jun 1	[a]0.00	Aug 13, 1976
Annual seven-day minimum	5.5	Mar 20	4.6	Jul 24	0.00	Sep 1, 1976
Maximum peak flow			161	Aug 1	[b]2,850	May 4, 1999
Maximum peak stage			4.08	Aug 1	9.66	May 4, 1999
Annual runoff (ac-ft)	9,120		10,490		10,810	
10 percent exceeds	20		24		37	
50 percent exceeds	12		12		8.8	
90 percent exceeds	7.0		7.4		1.2	

[a] Also occurred on many days during 1976-79 water years.

[b] From rating curve extended above 1,470 ft³/s on basis of flow through culvert analysis with flow over road measurement at gage height 9.48 ft.



07134990 WILD HORSE CREEK ABOVE HOLLY, CO

Upper Arkansas Basin
Upper Arkansas-John Martin Reservoir Subbasin

LOCATION (REVISED).--Lat 38°03'25.30", long 102°08'18.50" referenced to North American Datum of 1983, in NE ¼ NE ¼ sec.16, T.23 S., R.42 W., Prowers County, CO, Hydrologic Unit 11020009, on left bank 1,000 ft downstream from County Road No. 34, 0.7 mi northwest of Holly, and 0.7 mi upstream from mouth.

DRAINAGE AREA.--270 mi^2 of which 60 mi^2 probably is noncontributing (total area is approximate).

SURFACE-WATER RECORDS

PERIOD OF RECORD.--June 1995 to current year (seasonal records only).

REVISED RECORDS.--WDR CO-01-1: Drainage area.

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Elevation of gage is 3,405 ft above NGVD of 1929, from topographic map. Prior to Apr. 29, 1997, at site 1,050 ft upstream at datum 3.00 ft higher.

REMARKS.--No estimated daily discharges. Records fair except for those below 1.0 ft^3/s, which are poor. Natural flow of stream affected by diversions for irrigation, groundwater withdrawals, and return flows from irrigated areas, the Buffalo Canal, and the Amity Canal.

EXTREMES FOR PERIOD OF RECORD.--(seasonal only) Maximum discharge, 1,270 ft^3/s, May 26, 1996, from slope-area measurement of peak flow, gage height, 6.90 ft, from floodmark, site and datum then in use; maximum gage height, 8.63 ft, Aug. 7, 1997, from floodmark; no flow on many days during many years.

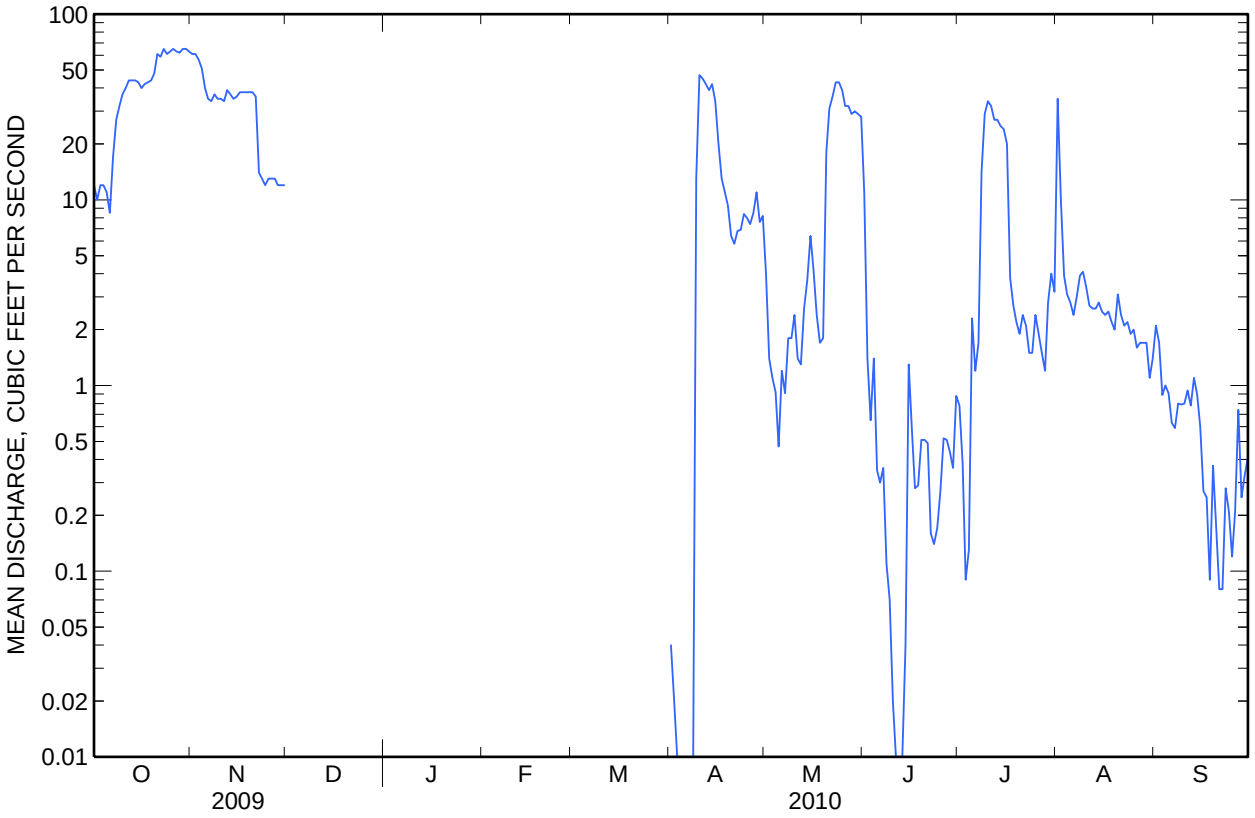
EXTREMES FOR CURRENT YEAR.--(seasonal only) Maximum discharge, 118 ft^3/s, Oct. 23, gage height, 5.15 ft; no flow, Apr. 6-8.

07134990 WILD HORSE CREEK ABOVE HOLLY, CO—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	12	61	---	---	---	---	0.04	4.0	11	0.78	35	2.1
2	10	61	---	---	---	---	0.02	1.4	1.4	0.38	10	1.7
3	12	57	---	---	---	---	0.01	1.1	0.65	0.09	3.9	0.89
4	12	51	---	---	---	---	0.01	0.92	1.4	0.13	3.1	1.0
5	11	40	---	---	---	---	0.01	0.47	0.35	2.3	2.8	0.91
6	8.5	35	---	---	---	---	0.00	1.2	0.30	1.2	2.4	0.63
7	17	34	---	---	---	---	0.00	0.91	0.36	1.7	3.0	0.59
8	27	37	---	---	---	---	0.00	1.8	0.11	14	3.9	0.80
9	32	35	---	---	---	---	13	1.8	0.07	29	4.1	0.79
10	37	35	---	---	---	---	47	2.4	0.02	34	3.4	0.80
11	40	34	---	---	---	---	45	1.4	0.01	32	2.7	0.94
12	44	39	---	---	---	---	42	1.3	0.01	27	2.6	0.78
13	44	37	---	---	---	---	39	2.6	0.01	27	2.6	1.1
14	44	35	---	---	---	---	42	3.7	0.04	25	2.8	0.89
15	43	36	---	---	---	---	34	6.4	1.3	24	2.5	0.60
16	40	38	---	---	---	---	20	4.2	0.60	20	2.4	0.27
17	42	38	---	---	---	---	13	2.4	0.28	3.8	2.5	0.25
18	43	38	---	---	---	---	11	1.7	0.29	2.7	2.2	0.09
19	44	38	---	---	---	---	9.3	1.8	0.51	2.2	2.0	0.37
20	48	38	---	---	---	---	6.4	18	0.51	1.9	3.1	0.17
21	61	36	---	---	---	---	5.8	31	0.49	2.4	2.4	0.08
22	59	14	---	---	---	---	6.8	36	0.16	2.1	2.1	0.08
23	65	13	---	---	---	---	6.9	43	0.14	1.5	2.2	0.28
24	61	12	---	---	---	---	8.4	43	0.17	1.5	1.9	0.21
25	63	13	---	---	---	---	8.0	39	0.27	2.4	2.0	0.12
26	65	13	---	---	---	---	7.4	32	0.52	1.9	1.6	0.21
27	63	13	---	---	---	---	8.5	32	0.51	1.5	1.7	0.74
28	62	12	---	---	---	---	11	29	0.44	1.2	1.7	0.25
29	65	12	---	---	---	---	7.6	30	0.36	2.8	1.7	0.33
30	65	12	---	---	---	---	8.2	29	0.88	4.0	1.1	0.41
31	63	---	---	---	---	---	---	28	---	3.2	1.4	---
Total	1,302.5	967	---	---	---	---	400.39	431.50	23.16	273.68	116.8	18.38
Mean	42.0	32.2	---	---	---	---	13.3	13.9	0.77	8.83	3.77	0.61
Max	65	61	---	---	---	---	47	43	11	34	35	2.1
Min	8.5	12	---	---	---	---	0.00	0.47	0.01	0.09	1.1	0.08
Ac-ft	2,580	1,920	---	---	---	---	794	856	46	543	232	36

07134990 WILD HORSE CREEK ABOVE HOLLY, CO—Continued



07137500 ARKANSAS RIVER NEAR COOLIDGE, KS

Middle Arkansas Basin
Middle Arkansas-Lake McKinney Subbasin

LOCATION.--Lat 38°01′39″, long 102°00′40″ referenced to North American Datum of 1927, in NE ¼ NE ¼ NW ¼ sec.26, T.23 S., R.43 W., Hamilton County, KS, Hydrologic Unit 11030001, on right bank at downstream side of county highway bridge, 1.0 mi south of Coolidge, 1.9 mi downstream from Colorado-Kansas State line, and at mile 1,099.3 .

DRAINAGE AREA.--25,410 mi² of which 1,708 mi² probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--May to October 1903, March to May 1921, October 1950 to current year. Monthly discharge only for some periods, published in WSP 1311.

REVISED RECORDS.--WSP 1341: 1903, drainage area.

GAGE.--Water-stage recorder. Datum of gage is 3,330.84 ft above NGVD of 1929. May 5 to Oct. 31, 1903, nonrecording gage, and Mar. 1 to May 31, 1921, water-stage recorder at present site at different datum. Oct. 1, 1950, to Mar. 31, 1966, water-stage recorder at site 0.3 mi upstream at datum 3.00 ft higher.

REMARKS.--Records fair except those for estimated daily discharges, which are poor. Combined flow of river and Frontier Ditch (station 07137000) represents entire flow that enters Kansas. Flow regulated since 1948 by John Martin Reservoir (station 07130000). Natural flow of stream affected by transmountain diversions, storage reservoirs, power developments, groundwater withdrawals and diversions for irrigation of about 500,000 acres, and return flow from irrigated areas. Satellite telemeter at station.

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010
DAILY MEAN VALUES

[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	85	179	122	133	118	125	101	81	64	637	310	90
2	83	187	122	130	121	125	106	79	49	623	278	92
3	89	188	120	130	122	126	123	78	46	590	206	85
4	96	170	121	131	124	124	111	74	48	591	172	83
5	101	163	126	131	125	120	112	69	52	650	158	77
6	91	161	122	131	124	120	114	69	55	695	144	69
7	86	157	e120	127	123	117	134	67	65	637	148	66
8	88	154	e114	e120	124	130	128	65	56	716	153	70
9	92	150	e110	e120	120	161	126	80	56	734	169	70
10	98	149	e110	e120	119	164	132	77	46	706	179	73
11	103	150	e110	e120	119	156	130	63	44	688	178	70
12	108	153	e110	121	118	147	126	64	48	670	159	67
13	110	148	e113	126	119	140	106	59	59	655	134	68
14	111	145	e143	126	120	136	102	59	74	628	129	63
15	108	151	155	127	118	129	105	71	106	619	131	60
16	101	158	147	127	118	125	89	80	112	644	134	58
17	106	157	151	130	117	124	86	79	95	646	126	57
18	104	152	147	129	119	122	89	71	93	611	116	56
19	104	151	146	128	121	120	85	66	216	583	e112	58
20	112	144	145	127	123	118	81	73	400	365	122	57
21	159	143	144	127	122	115	79	88	503	300	123	57
22	213	138	144	126	122	113	80	109	545	246	115	61
23	227	137	144	126	119	111	85	109	552	238	110	69
24	230	134	138	125	118	111	89	98	535	194	103	62
25	232	137	e137	122	120	112	84	90	556	183	96	54
26	236	137	e133	118	122	114	86	85	574	170	90	57
27	232	131	139	117	123	116	101	78	576	148	84	65
28	217	128	134	118	123	111	100	72	575	134	81	58
29	206	124	133	120	---	110	96	65	572	124	82	58
30	188	122	135	117	---	104	87	68	613	116	90	50
31	182	---	133	117	---	102	---	66	---	106	90	---
Mean	139	150	131	125	121	124	102	75.9	246	472	139	66.0
Max	236	188	155	133	125	164	134	109	613	734	310	92
Min	83	122	110	117	117	102	79	59	44	106	81	50
Ac-ft	8,530	8,920	8,070	7,670	6,710	7,630	6,100	4,670	14,650	29,050	8,570	3,930

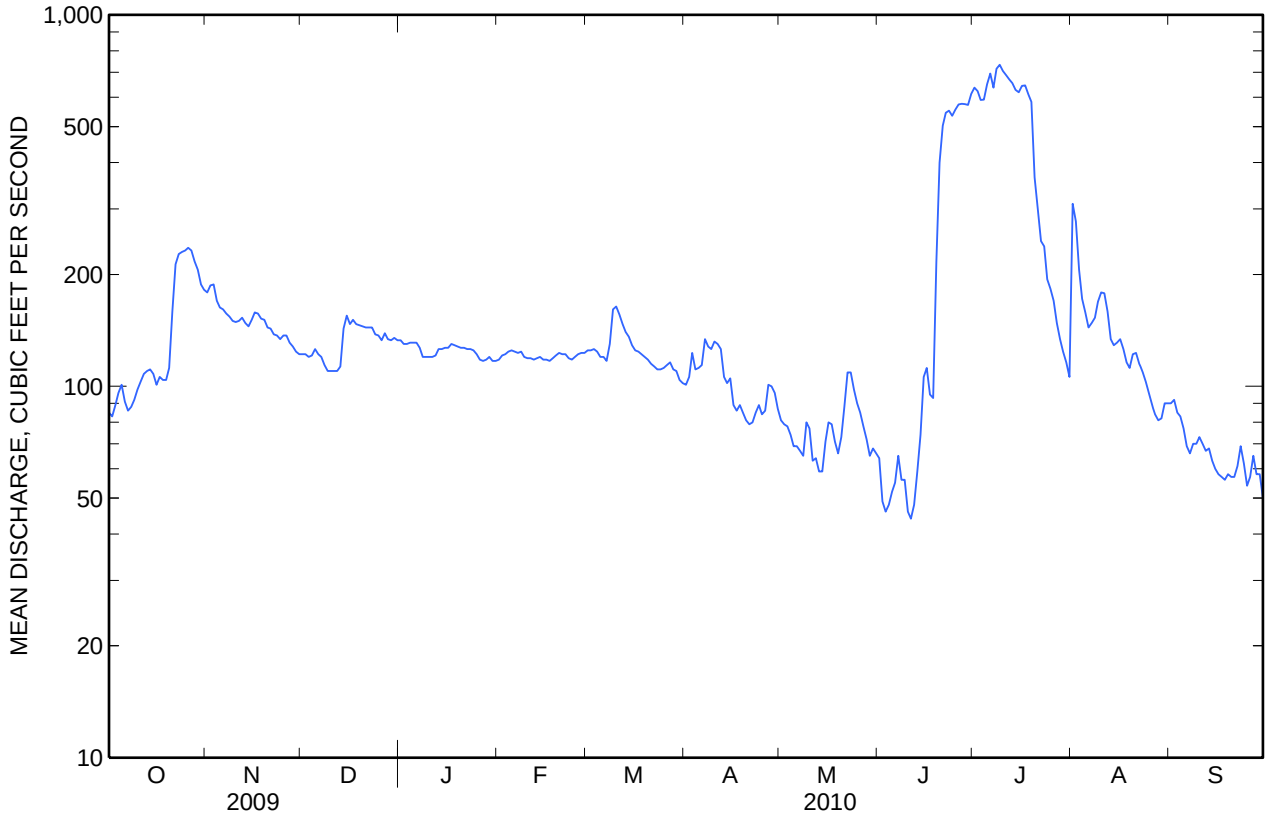
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1951 - 2010, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	128	119	123	129	134	130	203	293	447	362	303	167
Max	332	424	534	972	602	658	1,221	2,478	8,221	2,255	1,979	1,079
(WY)	(1998)	(1998)	(1998)	(1998)	(1966)	(1998)	(1987)	(1999)	(1965)	(1995)	(1965)	(1965)
Min	1.97	1.53	3.94	3.14	5.52	5.63	9.43	6.61	4.20	3.59	1.94	0.90
(WY)	(1979)	(1979)	(1979)	(1979)	(1978)	(1978)	(1979)	(1963)	(1954)	(1974)	(1964)	(1960)

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

SUMMARY STATISTICS

	Calendar Year 2009		Water Year 2010		Water Years 1951 - 2010	
Annual mean	144		158		212	
Highest annual mean					1,012	1965
Lowest annual mean					19.8	1979
Highest daily mean	614	Jul 8	734	Jul 9	101,000	Jun 18, 1965
Lowest daily mean	54	May 20	44	Jun 11	0.00	Jul 9, 1954
Annual seven-day minimum	61	May 18	53	Jun 6	0.00	Jul 9, 1954
Maximum peak flow			761	Jul 9	158,000	Jun 17, 1965
Maximum peak stage			5.33	Jul 9	14.80	Jun 17, 1965
Instantaneous low flow			40	Jun 4	0.00	many years
Annual runoff (ac-ft)	104,300		114,500		153,400	
10 percent exceeds	232		237		448	
50 percent exceeds	103		120		119	
90 percent exceeds	76		66		12	



07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1964-68, 1970-73, 1975-81, July 1999 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: November 1963 to September 1968, January 1976 to September 1981, October 2000 to current year.
WATER TEMPERATURE: November 1963 to September 1968, October 1976 to September 1981, July 1999 to current year.

INSTRUMENTATION.--Multiparameter water-quality monitor.

REMARKS.--Records good. Interruptions in record are due to ice conditions or malfunction of the recording instrument or sensors.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum, 6,800 miscrosiemens/cm, Mar. 29, 1978; minimum, 184 microsiemens/cm, Aug. 30, 2002.
WATER TEMPERATURE: Maximum, 36.4°C, Aug. 7, 2003; minimum, -0.2°C, Jan. 5, 2005.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 4,830 microsiemens/cm, Dec. 10; minimum, 1,360 microsiemens/cm, Aug. 1.
WATER TEMPERATURE: Maximum, 30.5°C, July 30, Aug. 8; minimum, -0.2°C, Dec. 4.

SPECIFIC CONDUCTANCE, WATER, UNFILTERED, MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		October			November			December			January	
1	4,380	4,270	4,330	3,650	3,560	3,600	4,180	4,130	4,150	4,270	4,200	4,240
2	---	---	---	3,580	3,500	3,550	4,180	4,150	4,160	4,280	4,240	4,270
3	---	---	---	3,560	3,360	3,440	4,220	4,170	4,200	4,280	4,210	4,250
4	---	---	---	3,780	3,560	3,680	4,300	4,180	4,240	4,250	4,200	4,230
5	---	---	---	3,820	3,780	3,800	4,320	4,160	4,250	4,220	4,190	4,210
6	---	---	---	3,850	3,800	3,830	4,220	4,190	4,210	4,250	4,190	4,210
7	---	---	---	3,860	3,820	3,840	4,290	4,200	4,260	4,440	4,250	4,340
8	4,130	4,050	4,100	3,920	3,840	3,890	4,590	4,280	4,430	4,600	4,340	4,470
9	4,100	3,980	4,060	3,960	3,920	3,940	4,750	4,590	4,690	4,530	4,280	4,400
10	4,000	3,960	3,990	3,970	3,940	3,950	4,830	4,570	4,730	4,380	4,160	4,270
11	3,990	3,900	3,930	3,960	3,930	3,940	4,700	4,370	4,580	4,240	4,170	4,210
12	3,900	3,830	3,870	3,960	3,930	3,950	4,400	4,120	4,300	4,230	4,170	4,200
13	3,840	3,780	3,810	4,010	3,950	3,980	4,200	3,970	4,100	4,260	4,180	4,220
14	3,860	3,760	3,820	4,030	4,000	4,020	4,170	4,000	4,120	4,230	4,150	4,190
15	3,950	3,840	3,880	4,020	3,900	3,960	4,270	4,170	4,230	4,180	4,110	4,150
16	3,960	3,900	3,930	3,900	3,880	3,890	4,250	4,090	4,190	4,190	4,120	4,150
17	3,950	3,780	3,880	3,940	3,860	3,880	4,150	4,080	4,110	4,130	4,070	4,100
18	3,930	3,860	3,910	4,020	3,940	3,990	4,180	4,140	4,150	4,140	4,100	4,120
19	3,920	3,890	3,910	4,030	4,000	4,010	4,200	4,150	4,170	4,150	4,110	4,130
20	3,900	3,690	3,830	4,060	4,020	4,040	4,200	4,160	4,180	4,170	4,120	4,150
21	3,690	3,000	3,300	4,090	4,060	4,080	4,200	4,160	4,180	4,150	4,110	4,130
22	3,020	2,770	2,910	4,100	4,030	4,060	4,200	4,160	4,180	4,140	4,120	4,130
23	3,150	2,840	3,050	4,070	4,050	4,060	4,190	4,100	4,140	4,150	4,110	4,130
24	3,180	3,110	3,160	4,110	4,060	4,090	4,220	4,120	4,170	4,140	4,110	4,120
25	3,210	3,160	3,190	4,100	4,050	4,070	4,440	4,200	4,360	4,180	4,140	4,150
26	3,210	3,170	3,200	4,060	4,030	4,050	4,470	4,300	4,380	4,230	4,170	4,190
27	3,310	3,210	3,240	4,120	4,060	4,100	4,300	4,140	4,240	4,220	4,170	4,190
28	3,340	3,300	3,320	4,140	4,120	4,130	4,260	4,180	4,230	4,220	4,090	4,170
29	3,440	3,300	3,380	4,140	4,120	4,130	4,260	4,220	4,240	4,140	4,050	4,100
30	3,580	3,430	3,520	4,160	4,120	4,140	4,250	4,200	4,230	4,250	4,110	4,170
31	3,580	3,540	3,560	---	---	---	4,250	4,200	4,230	4,240	4,180	4,200
Month	---	---	---	4,160	3,360	3,940	4,830	3,970	4,260	4,600	4,050	4,200

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

SPECIFIC CONDUCTANCE, WATER, UNFILTERED, MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

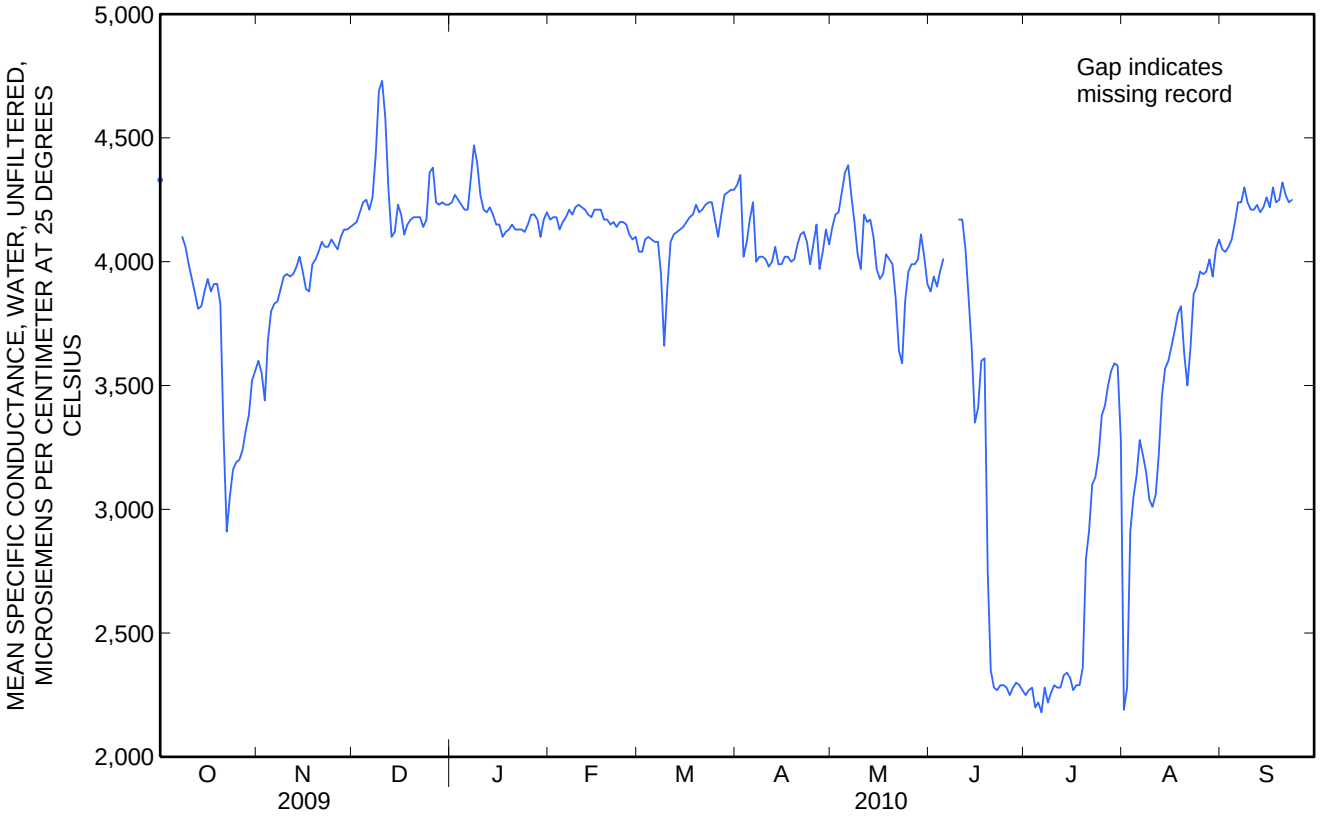
Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		February			March			April			May	
1	4,200	4,140	4,170	4,070	4,030	4,040	4,370	4,260	4,310	4,220	4,010	4,140
2	4,210	4,150	4,180	4,060	4,020	4,040	4,390	4,220	4,350	4,270	4,120	4,190
3	4,210	4,150	4,180	4,100	4,060	4,090	4,220	3,960	4,020	4,260	4,140	4,200
4	4,160	4,110	4,130	4,110	4,090	4,100	4,160	3,960	4,080	4,320	4,260	4,280
5	4,190	4,130	4,160	4,110	4,070	4,090	4,280	4,100	4,170	4,400	4,290	4,360
6	4,200	4,160	4,180	4,090	4,060	4,080	4,320	4,020	4,240	4,440	4,350	4,390
7	4,220	4,200	4,210	4,100	4,060	4,080	4,120	3,920	4,000	4,360	4,210	4,270
8	4,200	4,170	4,190	4,080	3,770	3,950	4,050	4,000	4,020	4,260	4,040	4,160
9	4,260	4,190	4,220	3,880	3,420	3,660	4,100	4,000	4,020	4,100	3,970	4,030
10	4,260	4,210	4,230	4,020	3,600	3,900	4,160	3,970	4,010	4,040	3,940	3,970
11	4,240	4,200	4,220	4,120	4,020	4,080	4,010	3,970	3,980	4,230	4,040	4,190
12	4,240	4,180	4,210	4,140	4,090	4,110	4,050	3,970	4,000	4,200	4,130	4,160
13	4,210	4,160	4,190	4,140	4,100	4,120	4,140	4,020	4,060	4,230	4,080	4,170
14	4,200	4,160	4,180	4,140	4,120	4,130	4,120	3,730	3,990	4,200	4,040	4,100
15	4,230	4,180	4,210	4,150	4,130	4,140	4,130	3,760	3,990	4,100	3,850	3,970
16	4,240	4,170	4,210	4,180	4,140	4,160	4,140	3,920	4,020	3,990	3,890	3,930
17	4,250	4,180	4,210	4,190	4,160	4,180	4,090	3,950	4,020	4,040	3,900	3,950
18	4,190	4,160	4,170	4,200	4,160	4,190	4,030	3,980	4,000	4,090	4,010	4,030
19	4,200	4,140	4,170	4,260	4,180	4,230	4,040	3,980	4,010	4,090	3,850	4,010
20	4,160	4,140	4,150	4,230	4,170	4,200	4,110	4,020	4,070	4,030	3,910	3,990
21	4,170	4,150	4,160	4,240	4,180	4,210	4,140	4,040	4,110	3,950	3,780	3,850
22	4,160	4,120	4,140	4,240	4,210	4,230	4,170	4,070	4,120	3,790	3,470	3,640
23	4,210	4,120	4,160	4,260	4,210	4,240	4,150	4,010	4,080	3,740	3,470	3,590
24	4,200	4,130	4,160	4,260	4,230	4,240	4,040	3,920	3,990	3,970	3,740	3,840
25	4,170	4,120	4,150	4,240	4,120	4,170	4,180	3,960	4,070	4,020	3,910	3,960
26	4,140	4,090	4,110	4,120	4,080	4,100	4,220	4,040	4,150	4,050	3,960	3,990
27	4,120	4,070	4,090	4,250	4,100	4,190	4,040	3,910	3,970	4,020	3,960	3,990
28	4,110	4,070	4,100	4,280	4,250	4,270	4,110	4,010	4,040	4,130	3,960	4,010
29	---	---	---	4,290	4,260	4,280	4,210	4,080	4,130	4,150	4,070	4,110
30	---	---	---	4,310	4,280	4,290	4,120	4,010	4,070	4,090	3,960	4,020
31	---	---	---	4,300	4,280	4,290	---	---	---	4,020	3,810	3,910
Month	4,260	4,070	4,170	4,310	3,420	4,130	4,390	3,730	4,070	4,440	3,470	4,050

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

SPECIFIC CONDUCTANCE, WATER, UNFILTERED, MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		June			July			August			September	
1	4,000	3,830	3,880	2,270	2,230	2,250	3,140	1,360	2,190	4,080	4,020	4,050
2	4,000	3,820	3,940	2,310	2,240	2,270	2,750	1,670	2,280	4,080	4,020	4,040
3	3,970	3,790	3,900	2,310	2,260	2,280	3,000	2,750	2,910	4,130	4,020	4,060
4	4,050	3,840	3,960	2,290	2,100	2,200	3,150	2,910	3,050	4,150	4,050	4,090
5	4,060	3,920	4,010	2,290	2,170	2,220	3,220	3,070	3,140	4,240	4,090	4,160
6	---	---	---	2,280	1,980	2,180	3,320	3,210	3,280	4,270	4,220	4,240
7	---	---	---	2,300	2,270	2,280	3,280	3,170	3,220	4,270	4,220	4,240
8	---	---	---	2,310	2,170	2,220	3,200	3,070	3,150	4,730	4,220	4,300
9	---	---	---	2,320	2,220	2,260	3,080	2,980	3,040	4,280	4,200	4,240
10	4,220	4,120	4,170	2,330	2,240	2,290	3,050	2,950	3,010	4,280	4,170	4,210
11	4,230	4,110	4,170	2,340	2,210	2,280	3,090	3,020	3,060	4,280	4,150	4,210
12	4,120	3,930	4,050	2,320	2,230	2,280	3,360	3,080	3,220	4,330	4,180	4,230
13	3,940	3,760	3,850	2,360	2,310	2,330	3,570	3,340	3,460	4,250	4,150	4,200
14	3,760	3,230	3,650	2,350	2,320	2,340	3,640	3,520	3,570	4,310	4,180	4,220
15	3,510	3,210	3,350	2,330	2,300	2,320	3,620	3,570	3,600	4,380	4,200	4,260
16	3,490	3,360	3,410	2,310	2,250	2,270	3,700	3,600	3,660	4,270	4,160	4,220
17	3,690	3,480	3,600	2,330	2,230	2,290	3,760	3,670	3,720	4,590	4,220	4,300
18	3,670	3,550	3,610	2,320	2,280	2,290	3,820	3,750	3,790	4,330	4,210	4,240
19	3,580	2,410	2,750	2,660	2,260	2,360	3,860	3,690	3,820	4,310	4,220	4,250
20	2,420	2,310	2,350	2,900	2,660	2,800	3,760	3,520	3,630	4,470	4,240	4,320
21	2,310	2,260	2,280	3,140	2,780	2,910	3,520	3,460	3,500	4,370	4,200	4,270
22	2,290	2,260	2,270	3,180	3,020	3,100	3,790	3,470	3,650	4,450	4,140	4,240
23	2,300	2,280	2,290	3,280	2,740	3,130	3,940	3,780	3,870	4,380	4,160	4,250
24	2,300	2,280	2,290	3,330	3,100	3,220	4,030	3,740	3,900	---	---	---
25	2,300	2,240	2,280	3,420	3,320	3,380	4,010	3,920	3,960	---	---	---
26	2,280	2,230	2,250	3,470	3,380	3,420	4,000	3,920	3,950	---	---	---
27	2,310	2,230	2,280	3,540	3,460	3,500	4,040	3,920	3,960	---	---	---
28	2,310	2,280	2,300	3,610	3,520	3,560	4,030	3,960	4,010	---	---	---
29	2,310	2,280	2,290	3,630	3,560	3,590	4,020	3,910	3,940	---	---	---
30	2,290	2,250	2,270	3,660	3,430	3,580	4,070	4,020	4,050	---	---	---
31	---	---	---	3,460	3,140	3,280	4,160	4,040	4,090	---	---	---
Month	---	---	---	3,660	1,980	2,670	4,160	1,360	3,470	---	---	---

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued



07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		October			November			December			January	
1	17.7	12.2	14.9	13.2	7.9	10.5	7.1	2.4	4.8	4.8	0.8	2.5
2	17.8	8.4	12.8	13.0	8.6	10.7	5.0	2.2	3.5	1.8	0.1	0.8
3	17.1	8.8	12.6	13.2	8.2	10.5	3.0	0.2	1.5	4.3	0.1	2.1
4	13.0	10.4	11.6	12.8	8.6	10.6	2.3	-0.2	0.6	5.5	1.1	3.2
5	20.7	12.4	15.5	13.4	8.3	10.8	3.0	-0.2	1.0	3.1	1.7	2.4
6	17.9	11.1	14.1	13.9	9.2	11.5	1.7	0.2	0.8	3.1	0.0	2.3
7	14.6	10.3	12.2	14.4	9.7	12.0	0.2	-0.2	-0.2	0.0	-0.2	-0.2
8	12.5	9.1	10.7	14.0	9.5	11.8	-0.2	-0.2	-0.2	-0.1	-0.2	-0.2
9	14.8	8.0	10.6	12.7	9.6	11.0	-0.2	-0.2	-0.2	0.7	-0.2	0.0
10	11.0	5.4	7.1	11.3	9.2	10.2	-0.2	-0.2	-0.2	2.1	-0.2	0.6
11	5.8	4.4	5.1	12.0	10.6	11.1	-0.2	-0.2	-0.2	5.0	-0.2	2.0
12	8.9	5.2	6.9	13.4	9.4	11.2	-0.2	-0.2	-0.2	5.7	0.8	3.1
13	9.7	7.5	8.5	11.6	10.2	10.7	0.5	-0.2	-0.1	6.6	1.2	3.8
14	10.7	8.2	9.3	12.4	9.4	10.6	2.6	-0.2	0.9	6.6	2.2	4.4
15	17.0	9.6	12.7	10.5	5.9	8.0	2.7	-0.2	0.7	6.4	1.9	4.1
16	18.2	11.1	14.3	8.0	4.6	6.1	4.3	-0.1	1.6	6.5	1.4	3.9
17	16.3	9.9	13.1	8.1	3.4	5.7	4.7	0.5	2.4	6.7	1.7	4.2
18	18.2	10.3	13.8	8.8	3.9	6.2	5.8	2.5	4.0	7.2	2.9	5.1
19	17.7	11.1	14.2	8.4	4.9	6.6	5.1	1.3	3.1	6.1	2.9	4.5
20	17.8	11.1	14.2	8.9	4.3	6.5	5.3	0.9	3.0	5.3	2.1	3.9
21	14.0	8.2	10.3	9.0	4.7	6.8	6.3	2.1	4.0	7.5	4.2	5.5
22	8.2	6.5	7.3	9.5	5.1	7.2	5.6	3.1	4.2	7.8	4.8	6.1
23	10.8	5.3	7.7	7.6	4.7	6.3	4.7	2.5	3.5	8.7	3.8	6.0
24	11.0	7.2	8.9	7.3	3.2	5.2	3.3	-0.2	1.3	7.2	3.5	5.2
25	10.4	9.2	9.8	7.6	3.1	5.3	-0.2	-0.2	-0.2	6.1	1.4	3.7
26	11.7	7.6	9.4	8.6	3.8	6.1	0.4	-0.2	0.0	5.1	0.9	3.3
27	10.0	6.9	8.6	8.9	4.2	6.5	3.4	-0.2	1.4	6.8	1.4	4.0
28	9.7	7.6	8.7	8.3	3.9	6.3	3.8	0.2	2.1	5.1	-0.2	2.3
29	9.3	6.4	8.1	7.6	4.7	6.0	3.6	0.9	2.2	4.6	-0.2	1.5
30	8.3	4.1	6.3	7.4	2.7	5.0	4.8	1.6	3.1	4.7	-0.2	1.8
31	12.2	6.6	9.1	---	---	---	5.9	2.7	4.0	6.1	0.3	3.1
Month	20.7	4.1	10.6	14.4	2.7	8.4	7.1	-0.2	1.7	8.7	-0.2	3.1

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		February			March			April			May	
1	8.1	3.9	5.5	8.1	4.6	6.3	17.3	10.9	13.8	19.8	10.2	14.8
2	7.6	1.8	4.6	13.0	6.0	9.0	15.3	7.7	11.1	18.0	10.4	14.5
3	6.0	2.4	4.4	13.1	5.8	9.3	15.4	6.3	10.7	21.6	10.4	15.7
4	5.9	3.6	4.6	12.5	6.8	9.2	18.4	8.2	12.9	23.3	11.6	17.0
5	8.0	2.2	4.9	14.0	7.0	10.1	19.3	9.7	14.3	21.8	11.3	16.1
6	7.1	3.0	4.9	14.0	5.7	9.8	17.3	10.6	13.9	23.6	10.8	16.5
7	5.4	3.5	4.5	10.8	7.4	9.2	14.3	8.3	11.2	18.8	10.3	14.3
8	4.7	2.9	3.7	11.6	9.9	10.5	17.3	7.3	11.9	17.5	11.0	14.1
9	5.5	0.0	2.7	13.6	8.0	10.5	18.4	8.9	13.4	20.4	9.4	14.6
10	5.4	1.8	3.3	12.8	8.4	10.1	17.8	10.1	13.8	18.5	13.8	16.1
11	7.3	3.5	4.8	9.9	6.9	8.3	20.0	11.0	15.2	19.2	11.9	15.0
12	8.9	2.6	5.6	12.1	4.8	8.3	21.2	13.3	16.9	17.1	12.1	14.0
13	9.4	4.4	6.9	13.9	5.5	9.5	21.1	13.2	16.7	20.8	9.4	14.8
14	7.6	3.1	5.3	10.4	7.6	8.5	20.7	14.1	17.1	15.9	11.4	13.7
15	6.6	0.2	3.2	11.3	6.6	8.5	20.3	14.6	17.3	16.8	12.0	14.3
16	7.3	0.4	3.7	14.6	5.5	9.8	18.0	12.8	14.8	20.7	13.1	16.7
17	8.8	1.4	4.9	15.9	7.3	11.4	18.9	10.8	14.3	23.0	14.4	18.1
18	9.7	3.9	6.7	15.4	8.3	12.0	20.2	11.1	15.3	20.5	15.1	17.6
19	9.8	4.3	6.8	12.5	4.8	7.6	15.3	12.5	13.5	20.2	14.6	16.7
20	7.0	3.3	4.5	9.0	2.3	5.3	17.1	11.8	14.2	22.4	14.3	17.5
21	3.3	2.0	2.7	13.1	3.0	7.6	15.7	13.7	14.5	24.5	14.6	19.1
22	4.6	1.4	2.8	14.4	5.8	9.7	18.6	13.3	15.4	24.7	17.8	21.1
23	7.2	0.0	3.4	14.5	7.0	10.6	15.7	11.5	13.8	24.4	15.1	19.7
24	9.0	1.5	5.1	10.4	5.7	6.8	14.9	9.3	11.9	24.3	18.6	21.1
25	8.6	4.1	6.2	13.3	3.4	7.8	18.1	8.4	13.2	22.2	15.2	18.6
26	10.6	4.8	7.4	15.0	6.4	10.3	17.8	9.9	13.8	23.7	17.0	20.0
27	11.2	3.8	7.5	11.7	8.0	9.5	19.9	10.2	14.8	27.4	17.2	21.8
28	8.6	5.5	6.7	15.5	5.2	9.9	18.7	11.7	15.2	27.9	18.2	22.6
29	---	---	---	17.6	7.3	12.2	21.8	12.1	16.1	25.8	17.5	21.6
30	---	---	---	19.7	10.2	14.7	18.4	11.3	15.0	24.8	16.1	20.3
31	---	---	---	18.4	11.6	15.1	---	---	---	25.6	16.3	20.6
Month	11.2	0.0	4.9	19.7	2.3	9.6	21.8	6.3	14.2	27.9	9.4	17.4

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued

TEMPERATURE, WATER, DEGREES CELSIUS
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
		June			July			August			September	
1	28.2	17.8	22.4	26.1	21.6	23.8	26.6	21.0	23.6	28.1	18.7	22.8
2	26.2	16.5	21.1	27.0	22.0	24.4	30.0	23.3	26.3	24.6	18.8	21.2
3	26.3	16.6	21.0	27.4	22.8	24.9	30.0	23.0	26.5	25.4	15.5	19.8
4	29.4	17.6	23.2	27.5	22.7	24.9	29.4	22.8	26.1	26.8	15.0	20.4
5	28.8	19.5	23.8	25.9	21.6	23.8	28.1	22.3	25.1	27.1	17.1	21.7
6	28.8	19.5	23.7	26.8	22.1	24.4	28.9	21.9	25.1	25.1	16.6	20.4
7	28.4	19.9	23.9	25.1	21.6	22.9	30.2	22.3	26.0	24.1	15.2	19.1
8	25.2	19.9	22.8	23.9	20.6	22.2	30.5	23.3	26.8	26.3	16.4	20.7
9	26.6	19.4	22.6	26.4	21.8	23.9	29.9	23.3	26.3	27.3	18.5	22.0
10	30.0	19.3	23.6	27.1	22.4	24.7	30.3	23.1	26.4	26.3	16.3	20.9
11	30.0	17.4	23.0	28.1	23.0	25.4	29.9	23.1	26.3	25.6	15.1	19.7
12	23.9	18.8	20.6	28.6	23.8	26.2	29.6	22.7	25.8	26.4	15.6	20.6
13	22.8	17.4	19.7	28.8	24.0	26.4	28.7	21.3	24.9	26.8	17.4	21.6
14	25.9	15.5	20.0	29.0	24.0	26.4	29.6	20.6	24.7	26.5	16.7	21.2
15	26.0	17.0	21.4	29.1	24.5	26.8	24.6	20.3	21.7	26.9	16.7	21.4
16	27.8	19.6	23.2	28.7	23.9	26.4	25.6	19.8	22.4	25.2	16.3	20.3
17	27.7	18.1	22.7	29.2	24.4	26.8	26.4	20.1	22.6	27.0	16.1	21.0
18	28.1	18.9	23.5	29.6	24.3	26.9	28.5	20.0	24.0	25.5	16.6	20.4
19	29.3	21.4	25.1	29.6	24.3	26.9	25.4	20.7	23.1	25.6	15.5	19.5
20	26.9	23.1	25.3	29.1	24.3	26.7	28.5	19.9	23.8	26.0	16.8	20.7
21	28.0	22.6	25.2	28.8	23.7	26.4	27.7	20.0	23.8	26.8	16.8	21.2
22	27.3	22.9	25.0	29.2	22.4	25.6	27.7	19.3	23.2	25.8	17.9	21.5
23	26.5	22.1	24.3	29.9	23.5	26.2	28.3	20.0	23.7	26.6	19.1	22.0
24	26.6	21.8	24.1	26.0	22.6	24.0	26.2	19.1	22.3	25.1	16.1	20.3
25	28.4	22.8	25.4	25.1	21.2	23.1	25.6	17.0	21.1	24.5	16.9	20.0
26	27.6	23.6	25.6	27.8	21.0	24.1	25.4	15.9	20.4	23.2	13.7	18.1
27	27.5	22.8	25.0	28.2	20.8	24.4	25.8	16.3	20.7	23.3	14.0	18.2
28	27.2	22.5	24.9	29.7	21.6	25.3	26.3	17.0	21.4	24.5	14.6	19.1
29	26.8	22.0	24.4	29.3	22.1	25.5	27.3	18.5	22.5	24.0	14.6	18.7
30	26.4	22.2	24.3	30.5	21.7	25.7	26.4	18.5	21.7	22.6	14.0	17.8
31	---	---	---	28.2	22.4	24.7	28.5	18.6	22.9	---	---	---
Month	30.0	15.5	23.4	30.5	20.6	25.2	30.5	15.9	23.9	28.1	13.7	20.4

	Max	Min	Mean
Year	30.5	-0.2	13.6

07137500 ARKANSAS RIVER NEAR COOLIDGE, KS—Continued